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Artificial Silk and the Electrical Industry.

THE opening of an artificial silk factory at Littleborough recently by British Visada, Ltd., draws attention to the ever-increasing production of this material, which is rendered commercially possible by the utilisation of electricity for motive power. It is perhaps not generally realised how closely interwoven have been the interests of the two industries; although it is a fact that artificial silk owes its origin to the electrical trade, the statement would be received by many with incredulity. Nevertheless, when in 1883 Joseph Swan was engaged in his efforts to find a suitable filament for electric lamps, he hit upon the idea of producing a filament by squirting nitro-cellulose through a tiny opening into a coagulating fluid and thus forming a thread, which, after suitable treatment, was nothing more or less than artificial silk. According to Mr. Arnold H. Hard, who has investigated this matter very closely in the last few months, it appears that Swan realised the value of this product to the textile trades, and that "artificial silks" were first exhibited under that name by him at the Inventions Exhibition in 1885.

For many years after that date, the connection between the two industries was not very close, except in so far as an increasing demand for electricity in artificial silk manufacture was experienced. As the fibre developed, however, more interest was taken in it for insulating purposes, as it had a high degree of resistance. Certain makes being almost entirely impervious to damp, its use has extended, and in at least one of the automatic telephone exchanges this material may be found. Artificial silk is also a highly decorative material, and as a covering for exposed flexibles it is therefore extremely useful. The duty recently placed on imported artificial silk is said to have beneficially affected electrical flexible cord makers, as a large portion of this class of goods was previously imported; despite both Customs and excise duties, no increase in home prices of artificial silk was made, and this month an actual decrease has taken place.

In the complex machinery utilised for the "spinning" of artificial silk—that is to say, for the formation of the viscose solution into thread form—electricity has played an outstanding part. In centrifugal spinning, which is now adopted in Great Britain and many of the leading producing countries, electrically-driven centrifugals are utilised to drive the spinning cans in which the "cakes" of yarn are wound.

The cost price of electrical power which is used by artificial silk factories in bulk is a very important matter, and some of the foreign firms which have been investigating the possibilities of manufacture in this country have found difficulty in obtaining supplies at a low enough price. It was reported some time ago that an Italian company which proposed to commence manufacture here asked for power from a North-Country corporation at a price which would have covered only the costs of coal, wages, and rent as shown by the undertaking at that time. In view, however, of the anticipated demand of 8,000 kWh per day, it is probable that the Corporation would have been able to effect some reduction in the cost if the proposal had been maintained. An examination of the costs of the various supply undertakings will reveal the fact that the towns with the cheapest supplies are those which in a number of cases already have artificial silk mills or have been approached by prospective companies.

Artificial silk manufacture therefore is closely associated with cheap electricity, not only for the sectional work mentioned above in connection with spinning, but for the whole of the plant. On July 15th there was opened at Littleborough, in Lancashire, the first all-British artificial silk factory, and the electrical installation carried out by The Metropolitan-Vickers Electrical Company is described in our later pages; a notable feature of the factory is the great saving effected by the use of exhaust steam for heating purposes, a system with which a public supply cannot hope to compete. Artificial silk may, broadly speaking, be manufactured in any country, though most of the thickly-populated countries are short of wood pulp and have to import it as their raw material. This question, however, seems quite likely to be partially solved in that the surplus chlorine obtainable from the manufacture of electrolytic caustic soda is now utilised for treating esparto grass with the object of preparing a cellulose said to be equal to the best Swedish pulp. The pulp is quite good for paper manufacture, but it is yet to be proved whether it is of the requisite quality for use as silk pulp. To this end research is being rapidly pushed forward.

Municipal Trading Manœuvres.

INTERESTING light is thrown on the recent history of the struggle between the municipal electrical engineers and the electrical contractors with regard to wiring powers by Mr. Walter Finlay, elsewhere in this issue. It will be remembered that on July 15th a clause, said to be "agreed," conferring on municipal authorities the power to sell and to install wiring and apparatus was debated by Standing Committee C in connection with the Electricity (Supply) Bill, but was rejected by 17 votes to 11 (out of a total of 80 members). Mr. Finlay, who is the secretary of the Electrical Contractors' Association of Scotland, gives an account of the negotiations which took place between the various bodies concerned, and shows that the clause in question had not been approved by his Association.

The clause which was offered by the contractors' representatives appears to have been a reasonable compromise, except in one respect: it did not permit the municipal authorities' workmen to carry out minor repairs to wiring and apparatus. Next to hire-purchase powers, efficient service is the most urgent necessity for the rapid development of the domestic applications of electricity, and efficient service cannot be given if the "trouble man" is forbidden to carry out small repairs on the spot, without invoking the assistance of another. For this reason we prefer the proposal approved by the municipal engineers—that they should have full powers, but that a Joint Advisory Committee should be set up to ensure that the powers were exercised in a reasonable manner. We do not agree with the Scottish Contractors that such a body would be unable to induce the local authority to play the game.

It should not be a difficult matter to arrive at a fair compromise between the two points of view, provided that the parties approach the question with a sincere desire to agree. Until this question is settled, full co-operation between the engineers and the contractors is hardly possible, and the extremists on either side who stand out for the whole of their demands are rendering an ill service to the industry. Apparently the greater share of the blame for the present deadlock must be laid at the door of the Scottish Association, for the English Association and the municipal authorities, as well as the B.E.A.M.A., the E.L.M.A., the E.W.F., and various other bodies are said to have agreed to the clause. However, we welcome the conciliatory attitude suggested by the concluding portion of Mr. Finlay's article, and hope that it may bear fruit at a later stage of the progress of the Bill. But it is, we think, a mistake to drag in by the heels the question of Boards of Guardians and that of the Civil Service, which are wholly irrelevant to the matter in hand. It is not in the least likely that local authorities, whose engineers know very well that no immediate result can be expected from the Bill when it becomes an Act, will precipitately engage large numbers of workmen in anticipation of a boom in installation work; nor would there be any difficulty in closing a wiring department in case of need—an unlikely eventuality. Nor is it of any use to maintain that the Scottish Contractors are fighting in the interests of the ratepayers; the short name for that argument is "cant."

Electricity Supply in Germany.

DEALING with the future of electricity supply in Germany, Herr A. Heinrichsbauer recently stated that two main points of view are becoming more prominent, namely, the necessity for connecting together the most important districts of consumption and the most favourable centres of production, as well as the development of very large areas of supply. At present the consumption in Germany can be reckoned at about 12,000,000,000 or 13,000,000,000 kWh per annum, of which about 3,000,000,000 kWh is consumed in the West of Germany The *per capita* consumption of the population at 200 kWh per annum is considerably less than that in Switzerland, Norway, the United States, and Sweden. It is therefore considered necessary to take steps to meet the expected large increase in the consumption in future years. Although the existing stations are largely designed for the use of coal and lignite, Herr Heinrichsbauer considers that water power will eventually form the chief source of supply, while coal and lignite stations will eventually serve as a stand-by during peak loads. A step in this direction is already being taken, for the great industrial region of Rhenish Westphalia is being brought within reach of the surplus water power of the Alps, as has also been done in France, Italy and Austria. This is being effected by a 220,000-V line, which proceeds from the district of Cologne to the South of Germany, and has already reached Mannheim. After having overcome the difficulties with Prussia and the Southern States, there now remains no further obstacle in the way of the extension of the line so as to connect with the water-power resources of the Vorarlberg, Bavaria and Switzerland, so that in future the Rhenish-Westphalian region will mainly be supplied by hydro-electric energy, and coal and lignite will be used for peak loads. Schemes of this kind can only be carried out by combinations of the greatest kind, passing over the limits of towns, provinces and states, and forming in themselves electricity supply provinces. The combination movement has been in evidence for a long time past. In 1913, Germany possessed 4,000 electricity supply stations; in 1924 the number had been reduced to 3,250, and a further diminution is assumed to have since taken place. During the same period the capacity of the power stations has increased over sixfold. It is estimated that about two-thirds of the total production is concentrated at present in large stations, the three largest works alone providing almost one-fourth of the total production. It is concluded from these circumstances that future movements will be in the same direction under private initiative, with the representation of public interests.

Minor Aerial Power Lines.

Some Notes on their Design and Construction.

By R. GRIERSON.

(*Concluded from page 131.*)

15.—Insulators and Insulator Bolts.

These accessories, for a given working pressure, naturally divide themselves into two main classes, namely, intermediate and terminal.

For all intents and purposes, the insulators used on poles erected in a straight line only have to carry the

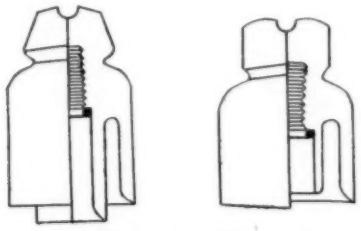


Fig. 19.—Standard Intermediate Insulators.

weight of the conductor and to withstand the wind pressure due to two half spans. The patterns available are almost as numerous as the grains of sand on the seashore. For pressures up to 500 volts, the writer has found the standard double-shed "Cordeaux" or "Ninepin" type, fig. 19, provided with a top groove, entirely satisfactory. Pins, spindles, bolts, or stalks, as they are variously called, are normally either $\frac{5}{8}$ or $\frac{3}{4}$ in. in diameter.

Fig. 20.—Pole Roofs.

On the Continent they largely favour the fitted insulator, *i.e.*, an insulator cemented to a swan-neck bolt that is screwed directly into the pole, but in this country we seem to prefer an insulator screwed to a straight bolt, a felt or rubber washer being used to avoid damage to the porcelain thread. The straight bolt is then fixed in the wood or iron cross arm or attached to the pole direct by means of a galvanised malleable cast-iron pole

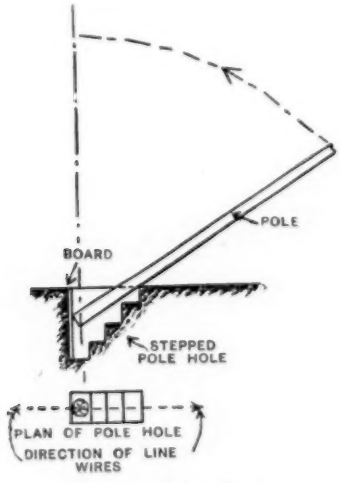


Fig. 21.—Pole-hole Details.

bracket, fixed by means of three 2-in. × $\frac{1}{2}$-in. galvanised coach screws. Special care should be taken in ordering up insulators, bolts, rubber washers, and cross arms or pole brackets to see that they all fit together satisfactorily.

For terminal and angle poles, straight bolts are unsuitable as they will not stand up to the pull exerted by heavy lines. Single or double "J" bolts prove quite satisfactory for light lines, *e.g.*, $\frac{5}{8}$ in. up to and including a 500-lb. pull, and $\frac{3}{4}$ in. up to and including a 750-lb. pull. For heavier pulls, some form of shackle insulator must be used, and it is desirable to fix these directly to the pole by means of galvanised "D" brackets. If fixed to cross arms difficulty may be experienced when straining up the lines.

16.—Pole Roofs.

To prevent rain soaking into the tops of the poles, a galvanised-iron roof is fitted to each. Two types are

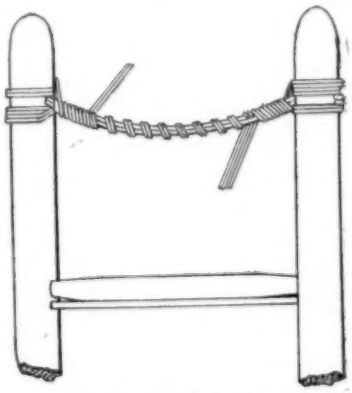


Fig. 22.—Wired Top Rung.

available, known as "cut" and "uncut" respectively, fig. 20. The former is provided with a special hole to clear the nut of a saddle or pinnacle insulator bolt, when used. The latter is the more usual form. Standard sizes are 8 in. by 6 in. by 6 in.; 10 in. by 7 in. by

Fig. 23. —Pole Erecting.

7 in.; and 11 in. by 8 in. by 8 in.; they are secured by means of four 2-in. galvanised rosehead nails.

17.—Earth Wires.

Wooden poles are usually fitted with an earth wire, which is intended to act as a lightning conductor. No. 8 S.W.G. (approx. 400 lb./mile) galvanised-iron

wire is normally employed. It is fixed to the pole by means of galvanised, No. 8 S.W.G., 1½-in. staples, spaced at 9-in. centres to a height of 8 ft. from the ground, and then at 24-in. centres to the top of the pole.

The earth wire is not connected to the galvanised roofs, but should project about 3 in. above the roof. It is as well to pick up all metal work on the way

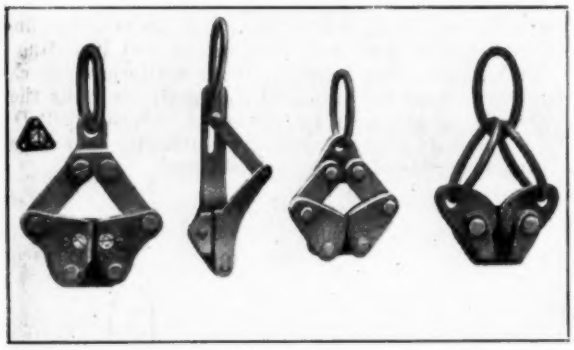


Fig. 24.—Designs of Draw Tongs.

down the pole, by forming a bight in the wire and clamping it under the bolt washer. At the butt of the pole the wire is formed into flat spirals and stapled in position. A single wire is sufficient for "A" poles, but for "H" poles one wire should be fixed on each pole.

18.—Numbering and Danger Plates.

It is desirable to number each pole with a stamped zinc number plate, which can be obtained from any of the usual sources. This facilitates reference, pole planting, and trimming with the correct equipment.

The Regulations do not call for low-pressure-line poles to be equipped with a danger plate, but they are quite inexpensive, and they form a clear indication to G.P.O. linesmen that the lines are carrying "strong" currents.

19.—Pole Steps.

Where employed to avoid the use of long ladders on high poles, pole steps are fixed on either side of the pole alternately, 18 in. apart, by means of two 3-in. coach screws.

To avoid the risk of unauthorised persons gaining easy access to the power lines the minimum height of the lowest step from the ground should be in no case less than 12 ft.—the higher the better.

20.—Pole Trimming.

For short cross-country lines, not following the roads, time would probably be saved if all the poles were delivered to a central point where they could be conveniently trimmed (*i.e.*, fitted with the various insulators, earth wire, roofs, &c.) under supervision. For longer lines, when the carting would prove an expensive matter, it would probably be necessary to dump the poles along the route and to trim or dress them against the pole holes.

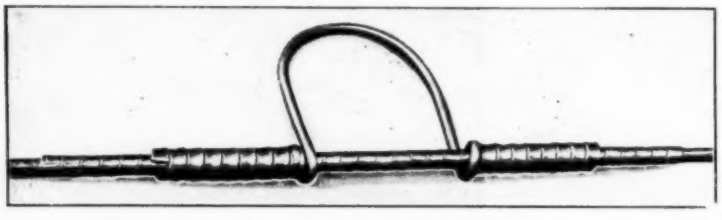


Fig. 26.—Binding Line to Insulator.

In either case, all the roofs, earth wires, insulator brackets, stay collars, stay wires, and other fittings should be fixed before erection, as much time would thereby be saved.

21.—Pole Planting.

The pole having been completely timmed, *i.e.*, the pole roof, earth wire, insulators and stay wires (if any) fixed, it is now ready to be planted. The minimum depths recommended for setting in ordinary firm soil are as follows:—

20-ft. poles	...	...	4 ft. deep.
30-ft. ,,	...	...	5 ft. ,,
40-ft. ,,	...	...	6 ft. ,,
50-ft. ,,	...	...	7 ft. ,,

The G.P.O. state that in rock cuttings and ground where blasting is necessary, poles may be set 1 ft. less than the authorised depth.

Pole holes are usually dug about 2 ft. wide and 6 ft. long—according to depth—in the direction of the line wires, and not across them. By this means the thrust of the pole, due to the wind pressure on the line wires and on the pole itself, is taken by solid undisturbed earth, and not by the newly made-up ground. The hole should be stepped down to the lowest point to facilitate the exit of the excavator and the introduction of the pole to the hole, fig. 21.

"Medium" poles up to 45 ft. in length can be erected by the use of two or more guy ropes and a stout ladder. The top rung of the ladder should be replaced by six strands of g.i. earth wire, fig. 22, threaded through the holes in the stiles in order safely to take the weight of the pole. The pole is carried up to the hole so that the butt rests against the vertical end, and a stout smooth board, preferably wetted or liberally served with soft soap or grease, is interposed between the butt of the pole and the vertical end of the hole, to assist the butt to slide down into place as the tip is raised. The men then raise the pole tip on their shoulders and it is pushed and pulled into the vertical position by means of the ladder and guy ropes, fig. 23. It is held against the vertical end of the hole by the men on the guy ropes while the remainder of the party fill in and tamp the excavated earth. A steadying line is required, in the direction of the ladder, to prevent the pole over-shooting the vertical position and kicking the butt through the bottom step.

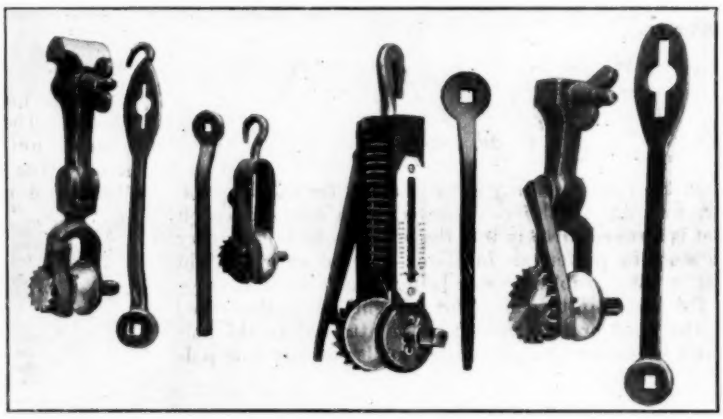


Fig. 25.—Types of Tension Ratchets.

22.—Wiring.

All power conductors, except possibly the very lightest, will probably be delivered on cable drums. The drum should be carted to the nearest terminal pole, mounted on jacks on sound, level ground, and the line run out along the pole route. Depending on local circumstances, the weight of the conductor, and whether the linesmen are familiar with the use of climbing irons, the two, three or four lines may be run out along the ground and then lifted into position on the poles. Alternatively, the line may be lifted into position as

each pole is reached. With heavy lines, snatch blocks may prove useful. *Great care must be exercised at road and rail crossings.*

In France, the present writer witnessed a royal tug-of-war between a locomotive and a 19/16 hard-drawn copper cable, temporarily left slack over a little-used siding. The 19/16 eventually parted and the locomotive won.

The slack in the various spans is taken up by hand as far as possible. When the pull becomes too heavy, draw tongs of suitable weight are attached to

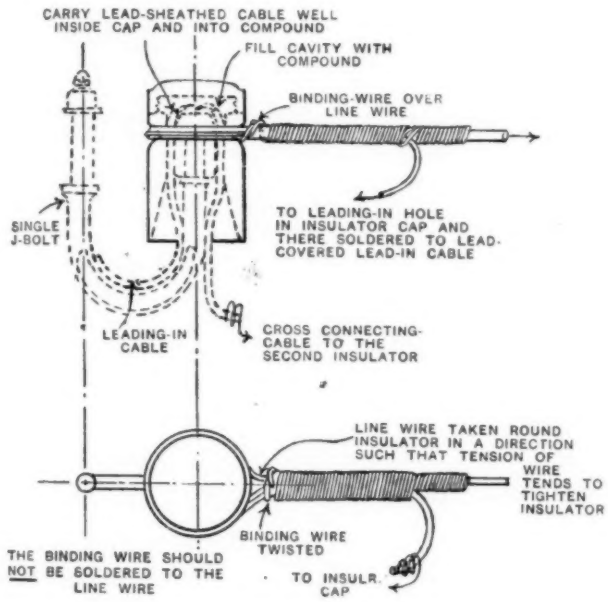

CARRY LEAD-SHEATHED CABLE WELL INSIDE CAP AND INTO COMPOUND
FILL CAVITY WITH COMPOUND
BINDING-WIRE OVER LINE WIRE
SINGLE J-BOLT
TO LEADING-IN HOLE IN INSULATOR CAP AND THERE SOLDERED TO LEAD-COVERED LEAD-IN CABLE
LEADING-IN CABLE
CROSS CONNECTING-CABLE TO THE SECOND INSULATOR
LINE WIRE TAKEN ROUND INSULATOR IN A DIRECTION SUCH THAT TENSION OF WIRE TENDS TO TIGHTEN INSULATOR
BINDING WIRE TWISTED
THE BINDING WIRE SHOULD NOT BE SOLDERED TO THE LINE WIRE
TO INSULR. CAP

Fig. 27.—Terminating at "J" Insulators.

the end of the line and the final strain is applied by means of a graduated spring-tension ratchet temporarily secured to either the final or an intermediate terminal pole. When all the wires have been run over a certain section and strained up at the terminal pole, it will be necessary, on the heavier lines, to regulate the strain on a few spans at a time.

When the lines are pulled up, due regard must, of course, be paid to the external temperature and to the gauge and material of the wire employed. (See tables issued by the G.P.O. and the Helsby Company, previously referred to).

Spring-tension ratchets, fig. 25, calibrated in pounds weight (obtainable from the usual suppliers) are inserted between the draw tongs, fig. 24, and the pole used as a temporary anchorage.

23.—Binding-in and Terminating.

Various methods are in use for securing the line wires to the insulators. Most readers will probably remember that the frequent failure of trolley wires in the early days was due to the fact that the insulator was rigidly fixed to the pole arm, and each time a car passed the trolley arm forced the wire up. The continual bending at the one point resulted in premature failure. Aerial power lines, although not bent by passing trolley arms, constantly sway in the wind, and in accepting any form of binding or tie-in, careful attention should be given to the design to ensure that the restraining force is gradually applied and that the bending backwards and forwards does not take place at one clearly defined point.

The high tensile strength of hard-drawn copper wire is chiefly due to the outer surface or skin, so that even a deep scratch on the wire at right angles to its length will appreciably decrease the tensile strength. For all sizes, therefore, up to and including 0.035 sq. in., the G.P.O. recommend the use of flat binding tapes under the binding wires employed by them for tying in the line wires to the insulators. For binding the line wire into the insulator either ordinary bare copper wire or special copper binders having a circular centre section and flattened ends may be used, fig. 26.

Standard sizes for insulators having a $1\frac{3}{4}$-in. neck diameter are as follows:—

Weight of line wire.	S.W.G. of binders.	Length of binders (in.).	Length of tapes (in.).	Width of tapes (in.).
800 } 600 }	8	23	24	$\frac{1}{4}$
400 } 300 }	11	$20\frac{1}{4}$	22	3/16
200 } 150 }	12	17	18	5/32
100	14	17	18	5/32

The lighter wires can be terminated either at single "J" or shackle insulators, fig. 27, by bending the conductor round the insulator and then lapping the double conductor with binding wire, after the method of making a Britannia joint, except that a tail is left for the purpose of connection. To avoid softening the hard-drawn copper wire, no part that is under tension should be soldered.

To reduce the heavy cost of labour involved in binding-in, terminating, and jointing, the majority of the suppliers list mechanical clips and clamps, several of which are worth careful consideration. To enable heavy lines—0.035 sq. in. and over—to be made off safely to shackle insulators some form of mechanical clamp, fig. 28, is desirable, if not essential.

24.—Conclusion.

Lest any enthusiastic reader, after digesting the details contained in these articles, decides to dash off and erect a few miles of aerial line, the following extracts are added from the Regulations and the 1899 Act as a closing item, and as a warning of the heinous character of the proposed offence.

"Overhead lines shall not, after the date of these regulations, be erected or maintained except in accordance with such regulations as the Commissioners may prescribe."—(Electricity Supply Acts, 1882/1919. E.I.C.38 Regulations of the Electricity Commissioners (*a*) for ensuring the Safety of the Public, and (*b*) for ensuring a proper and sufficient Supply of Electrical Energy.)

The Postmaster-General is also interested in the matter, *vide* Electric Lighting (Clauses) Act, 1899, Vict. 62 and 63, Ch. 19, Section 14.

"14 (1) When the exercise of any of the powers of the Undertakers in relation to the execution of any works (including the construction of boxes) will involve the placing of any works in, along, or across any street or public bridge, the following provisions shall have effect.

"(2) One month before commencing the execution of the works . . . the Undertakers shall serve a notice upon the Postmaster-General and the local authority, describing the proposed works, together with a plan of the works showing the mode and position in which the works are to be executed. . . ."

Fig. 28.—Some Mechanical Clamps.

Alloy for Trolley Wire.—According to *Science*, tests which have been conducted on trolley lines made of a new copper alloy, produced by the addition of 1 per cent. of metallic cadmium to trolley-wire copper, have shown that the alloy lasts about three times as long as the basic metal. In a series of tests by Dr. M. F. Budgen, copper wire was used for a period of 130 days with a resultant wear of 6 per cent., while a cadmium-copper wire of the same gauge suffered a reduction of only 12 per cent. in 730 days' service. The conductivity of the alloy is said to be only slightly lower than that of copper.

Electricity Supply in Great Britain.—XVI.

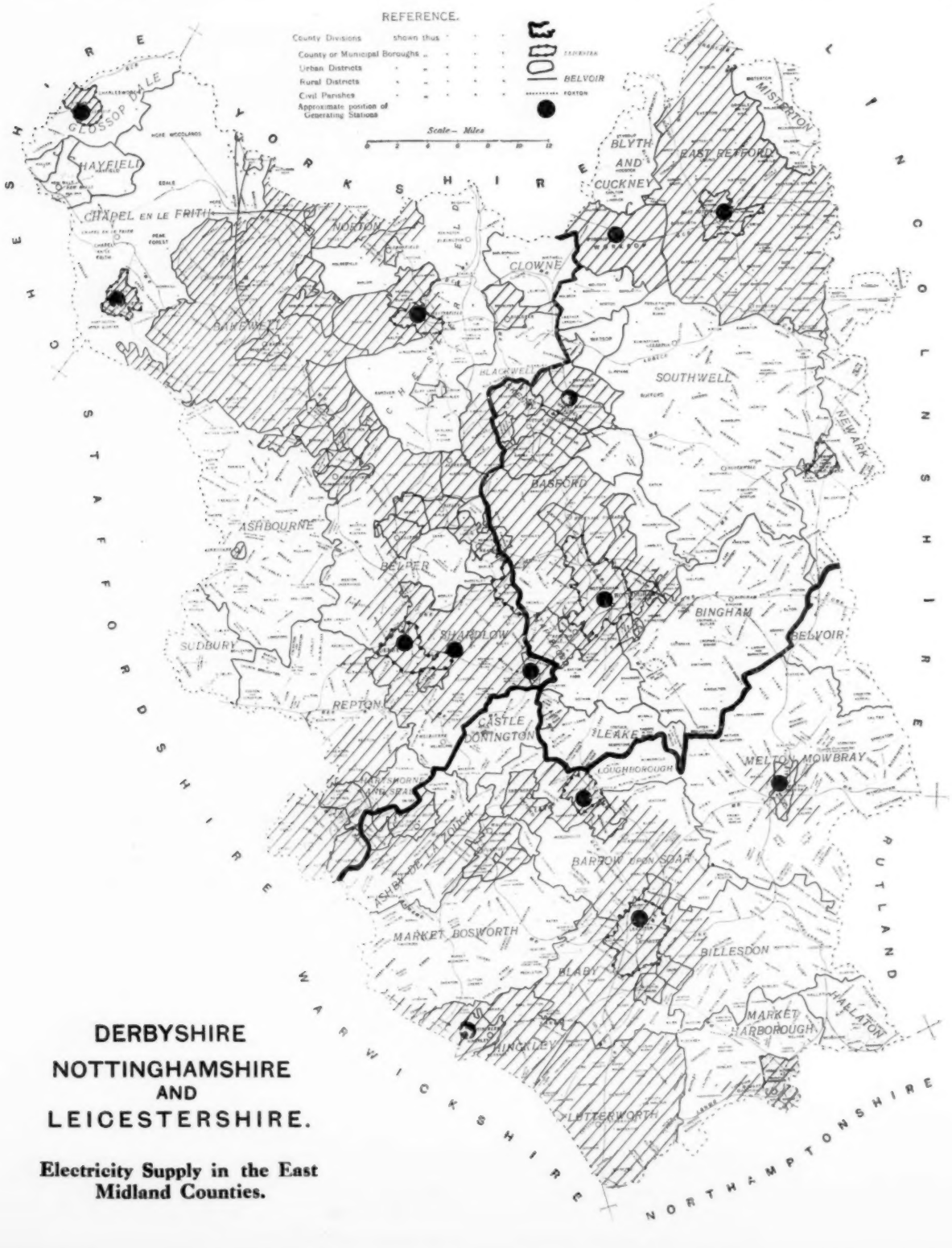
Derbyshire, Notts., and Leicestershire.

THE Derbyshire and Notts. Electric Power Company and the Leicestershire and Warwickshire Electric Power Company have various powers under their Acts over most of the area shown on the accompanying map, but it has only been hatched where statutory powers for general supplies of electricity are held or have been applied for.

The East Midlands Electricity District, as approved by Parliament, includes Burton-on-Trent C.B. and Tutbury R.D. (Staffs.), as well as the greater part of the area of this map.

The total number of kWh generated in this Electricity District as given in the Electricity Commissioners' publication, "Generation of Electricity in Great Britain," is as follows:—

Year ending March 31st.	(Area No. 11) kWh generated.
1922	112,468,006
1923	135,063,156
1924	156,586,360
1925	183,480,057



Electricity Supply in the East Midland Counties.

Further particulars of the East Midlands Electricity District and Advisory Board are given in the Fourth Annual Report of the Electricity Commissioners.

The 1921 Census gives the following figures for the above Administrative Counties and associated County Boroughs :—

	Acres.	Persons.	Resident Families.	Buildings not containing dwellings.
Derby. ...	650,369	714,662	160,402	8,618
Notts. ...	540,123	641,149	149,267	8,197
Leicester.	532,779	494,469	116,536	6,787
Total ...	1,723,271	1,850,280	426,205	23,602

The following is a list of the existing authorised undertakers whose areas are wholly or partly included in the map :—

Local Authorities.

Buxton Corporation.
Chesterfield Corporation.
Derby Corporation.
East Retford Corporation.
Kettering Urban District Council.
Leicester Corporation.
Long Eaton Urban District Council.
Loughborough Corporation.
Mansfield Corporation.
Newark Corporation.
Nottingham Corporation.
Sheffield Corporation.
Worksop Urban District Council.

Companies.

Derbyshire and Nottinghamshire Electric Power Co.
Leicestershire and Warwickshire Electric Power Co.
Melton Mowbray Electric Light Co., Ltd.
Urban Electric Supply Co., Ltd.

Applications for Special Orders under Section 26 of the Electricity (Supply) Act, 1919, have been lodged by the following :—

Burton-on-Trent Corporation (extension).
Long Eaton Urban District Council (extension).
Bolsover Urban District Council.
Derbyshire and Nottinghamshire Electric Power Co.
Midland Electric Light & Power Co., Ltd.

The map is reproduced by permission of the Controller of H.M. Stationery Office. The originals were prepared by the Ordnance Survey Department for the 1917 Boundary Commission. Since 1917 many alterations to areas, names of places, &c., have been made, of which particulars are available if required. Since the map was engraved, another application for a Special Order has been lodged by the Pooley Hall Colliery Co., Ltd. (*vide London Gazette* dated July 9th, 1926, page 4,562). This application includes the following parishes or townships :—Appleby Magna, Chilcote and Stretton-en-le-Field in the Rural District of Ashby-de-la-Zouch, and Norton-juxta-Twycross, Orton-on-the-Hill, Sheepy Magna, Sheepy Parva and Twycross in the Rural District of Market Bosworth, in the County of Leicester.

Present Prices and Values.

Some Hints on Making New Tariffs.

By "INVICTUS."

WITH the completion of a successful financial year by the electricity undertakings, the question of price reduction will come under review, especially by people who may have more interest in a reduction than the engineer responsible. He, probably, has a clear idea of the need for further capital expenditure, and is perhaps a little conscious of the too popular desire for the price of light to be reduced. This occasion appears to be the opportunity to leave fairly high flat rates alone, and to offer a set of alternatives with one unit price—the minimum to a tenth of a penny—in conjunction with different forms of standing charges, or higher group-graded rates to suit every class of load.

Supply engineers, generally, will agree that the most likely survivor of all tariffs is a simple range of flat rates—the fewer the better. But with load factors steadily and constantly improving, in spite of enormous additions to "watts connected" it is difficult to attribute definite diversity to some classes of load—domestic heating and cooking, for instance. Flat rates are bound to be arbitrary for the present; they should, therefore, be on the safe or high side.

It has been urged again and again that it is the supply authority's business to quote competitively, as low as it can against the next available means. It has even been stated that in making tariffs, what is expedient should displace what is strictly correct if, by that means, additional business can be obtained, and a satisfactory balance sheet maintained. But that principle of making one class of consumer pay for another is wrong. We should not set out to get any class of load by "cooking" our tariff, not merely because it is not right, but also because there is no load which a reasonably efficient modern station cannot meet at rates which are competitive with the next best medium—at present distributed gas. Small, isolated stations are in a category by themselves, and it is impossible to bring them fairly into any generalisations upon costs or tariffs. A remote water-power station might easily beat the most modern super-steam station.

Reasonable dividends on capital invested, depreciation or amortisation and reserve are, admittedly, charges as just as the coal bill, but the dropping of prices to consumers should only be considered when every other expense has been met, including publicity and the provision of an adequate sales organisation in fairly representative offices.

It does, of course, feel safe to follow a sort of rule of thumb and make reductions based upon last year's meter readings. Some of us have heard such a remark as: "Now, Mr. Engineer, can't we knock a halfpenny off the lighting rate?" That sort of reduction is always tempting and certain to be popular, but it may not serve the best interests of the undertaking or the industry generally. The wrong rate may be reduced, or all the rates in the wrong proportion.

If it is just remembered that an incandescent gas burner consumes about 5 cu. ft. an hour and gives a nominal 60 c.p. with a new mantle, it may be observed that it is not *necessary* to offer electric light at less than the local price for 125 cu. ft. of gas, or about ⅘th of the therm rate. After all, there are manifest advantages with electric light quite apart from price—more than enough for a moderately good canvasser, especially if he can arrange terms for the house wiring.

It is true that good modern shop lighting, for example, greatly excels ordinary gas standards of illumination. It caters for advertisement besides giving enough light to sell goods by, and should pay its fair and full share to the undertaking's revenue.

If there are any who need to be convinced of this, let them take the figure for last year's total revenue of their undertaking and, if the income was insufficient, increase the amount as necessary to cover all charges. From the full figure, deduct the fuel bill and divide the remainder by the station peak load for the year. The figure so obtained may be called the standing charge per kilowatt of station peak load. The running cost may be taken to be the fuel cost per unit. Possibly the actual figures may approximate to £15 and 0.5d.; it will be convenient to assume they do so for the purposes of this article.

Now there are two classes of load which entirely overlap the peak of any station in which the lighting load predominates. These two loads, having a diversity of 1 are: constant demand 24-hour loads (such as are used for water heating) and shop-window lighting. The constant demand will last 8,760 hours, and £15/8,760+0.5d.=0.91d. per unit. Shop window lighting averages two hours' use per day for 150 days, a total of 300 hours per annum, and £15/300+0.5d.= 12.5d. per unit. If shops will extend their hours of use by late burning of lamps for advertisement purposes, they can have all the rest at 0.5d. per unit, and so reach a still equitable lower average price. These are just rates which each of these classes of load should pay to square with the basic rates taken for the example.

It is confirmed by the foregoing, if it was not apparent in any case, that lighting flat rates should not be reduced below the local gas equivalent. It is also well understood that the water-heating load justifies its competitive rate and if, by means of a throw-over switch, the water-heating coil cannot be used when the light (or the living-room portion of it) is in use, it is deserving of further abatement down to the running cost figure, without making any concessions to expediency.

It is not prudent to overlook the possibility of a very much more efficient lamp than we have to-day, so that in deciding assessment rates it is well to avoid basing the fixed charge upon the wattage connected for lighting. Rateable value, floor space, room space, and candle power are all fairly widely adopted. Window space may commend itself for shop-window lighting.

In the application of assessments to power and heat, we need not depart from electrical measurements. For power uses electricity should be rated high, more especially for casual power, such as the sausage machine, chaff cutter, and many others. These have negligible load factors, but considerable diversity. They should not be lumped with regular industrial power, which should be purchased upon a load-factor basis with a diversity of not more than 2 divided into the station peak standing charge. Shop and office heating comes generally within the same category, but it may receive some abating consideration in that it is partly domestic. It has little summer use, so that it has a poorer load factor than industrial power; it is, however, a valuable day load where little but lighting would otherwise exist, so that it greatly assists distribution charges. This, together with the domestic element of the shop-parlour, doctor's surgery, private-house office, and so on, gives it a legitimate claim to rank *pari passu* with domestic uses.

Pure domestic loads do not yet exist widely enough for their true qualities to be judged. Their diversity will be enormous in relation to any annual station peak. They are also seven-day loads, with a Sunday daylight maximum. With lighting included, they will probably very soon attain a diversity of 5 and individual load factors of 10 per cent. With the example figures previously taken, this suggests an average flat rate of £3/876+0.5d.=1.32d. per unit. A diversity in excess of 5 cannot with safety be assumed at present for the domestic loads, because most of them are used more or less tentatively by a section which is not representative of the whole community. This load is building, and now is the time to remodel the distribution system. It is perhaps hardly necessary to say that this should not be attempted out of revenue or reserves. Such additional capital charges as are incurred from time to time will not make the domestic rates unacceptable whilst they are equitably assessed and include lighting.

When considering the costs for domestic purposes, it is interesting and helpful to examine the money value of those latent economies which are very often referred to, but rarely priced. The following summary is offered for criticism, extension, or amendment, always remembering that it is bad publicity to "cry down" the other fellow's wares, but legitimate to extol one's own:—

SAVINGS WITH ELECTRIC HEATING AND COOKING.

	Per annum.
Fire lighters or kindling wood	£0 15 0
Lighting 300 fires, at 1d.	1 5 0
Sifting cinders, 200 times at 1d.	0 16 8
Carrying coal, 450 times at ½d.	0 18 9
Chimney sweeping	0 10 0
Flue cleaning, 30 times at 6d.	0 15 0
Matches, 3 doz. boxes, at 10½d.	0 2 9
Blacklead and brushes	0 10 0
Coal ordering, delivery, and tips	0 10 0
Extra washing, cleaning, and dusting due to fires	1 0 0
Soot falls and smoke nuisance	1 0 0
	£8 3 2

110,000-Volt Transformers.

"English Electric" Plant for an Indian 100,000-H.P. Transmission Scheme.

THE largest and most recent of the enterprises of the Tata Companies in India for the supply of electricity to Bombay and its environs provides for the construction of a hydro-electric generating station at Bhira and the transmission of some 100,000 h.p. to the city by an overhead line about 75 miles long.

This important scheme is well advanced; electricity will be generated at 11,000 volts, 50 cycles, 3-phase, stepped up to 110,000 volts for transmission, and transformed to 23,000 volts for main distribution. At the power station the four banks of transformers, each bank consisting of three single-phase units having an output of 30,000 kVA, will have their high-voltage windings star-connected with solidly and permanently earthed neutral, and advantage has been taken of this condition to use graded insulation in the transformers. One end of the h.v. winding is connected to an outlet bushing and the other end is connected to the transformer core; the test pressure applied to a transformer designed in this manner can only be an induced voltage, the value being 2.73 times the normal voltage to earth, making the test figure in this case 173,000 volts, with one end of the winding earthed.

At the receiving station in Bombay the four banks of transformers, each bank of 27,000 kVA consisting of three single-phase units with their high-voltage windings connected in delta, were tested from the h.v. to the l.v. windings and earth at 240,000 volts. The problem of insulating these transformers is obviously very much harder than in the case of star-connected windings with the neutral solidly earthed. The manufacture of the twelve receiving transformers was entrusted to the English Electric Co., Ltd., and was carried out at its Stafford works; they rank amongst the largest transformers manufactured in England up to the present time.

The transformers are of the core-type with the windings on two vertical limbs, oil-immersed, water-cooled, and arranged for outdoor service. Each silicon-steel core lamination is coated on one side with a thin layer of a composition that does not deteriorate with heating. Internal cooling oil ducts in the plane of the laminations, unless many are provided, are of little value, for the reason that the efficiency of heat transmission through a packet of laminations is very poor, due to the large number of imperfectly connected sur-

faces in series. The correct position for an oil duct in such a core is clearly at right angles to the laminations, so that the heat is transmitted along the plane of the laminations instead of across it, an arrangement well illustrated in fig. 2. A $\frac{3}{4}$-in. duct completely round the core converts it virtually into two separate cores, one concentric with the other; to close the duct the outer packet of laminations (the core being of double cruciform section) is left solid, and by means of insulated

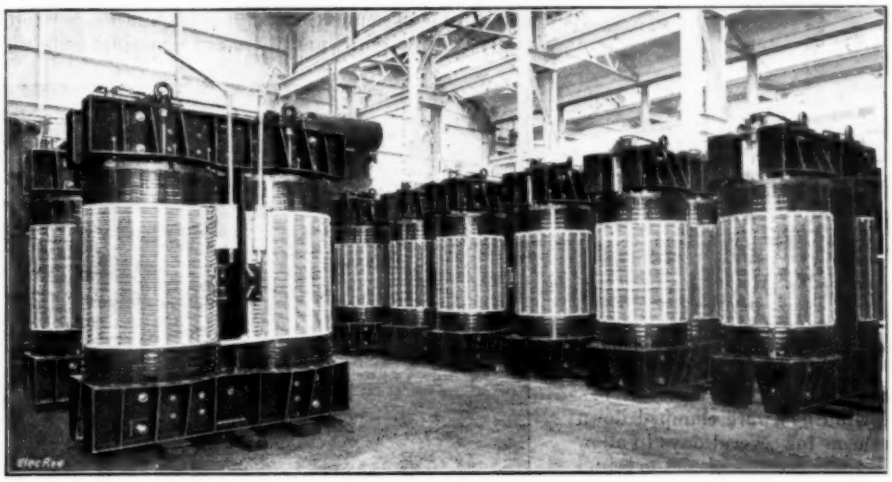


Fig. 1.—Eight Transformers at the English Electric Co.'s Stafford Works.

bolts and external clamping plates the two cores are bolted together. In order that the oil may gain entrance to, and exit from, the duct, a small portion of the laminations is cut away in the outer packet of the bottom and top yokes. The yoke laminations are interleaved with the limbs, and in the four outside corners of the core are rectangular notches containing square bolts which key the yoke and limb laminations together, and also clamp the main frames to the yokes. This design allows the transformer to be lifted entirely from the top main frame, and no vertical tie-bolts are required between the top and bottom frames.

The composite conductor of the l.v. coil consists of four rectangular wires, alternately bare and double-cotton covered, lying side by side parallel to the axis

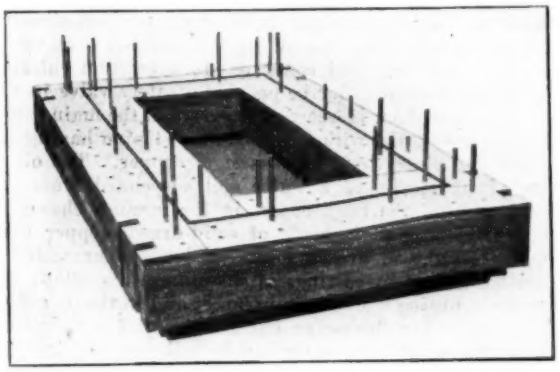


Fig. 2.—Core, showing Internal Oil Duct and Key Bolt Slots.

of the coil; the insulation between turns is a fullerboard strip taped to one of the wires as indicated in fig. 3. The foundation of the coil is a bakelised paper cylinder, on which the composite conductor is wound in two layers with a sheath of insulation between them. Oil ducts are formed on both sides of each layer of winding by inserting vertical fullerboard spacers, which extend to the full length of the coil, inclusive of the supporting collars at the top and bottom. For supporting the winding in the axial direction, at each end of each layer of winding is a collar which is cut from a bakelised paper cylinder formed to the same dimensions as the layer of winding itself and shaped on the winding side to the spiral form of the winding; the extreme ends of all the collars are flush and at right angles to the axis of the coil, and through the ends of the vertical spacers and the collars brass bolts are inserted for keeping them in position. Each coil has two tappings, in addition to the start and finish leads.

The h.v. winding on each limb consists of single-section disk coils arranged in a column with a fullerboard washer and oil duct between each pair; the two columns of coils are connected in series at the bottom. The conductor is a flat wire with half round edges, encased in a sleeve of layers of paper, specially treated cloth, and cambric, the latter being largely mechanical protection for the paper and treated cloth. The sleeve is folded on to the conductor while the coil is being wound, and is held in place with a spiral of cotton tape. In addition, a fullerboard strip is inserted between turns, as shown in fig 4, and in those coils which have specially reinforced insulation between turns, the number of layers of material in the sleeve is increased and also thicker strips of fullerboard are used. The line coils withstood a test pressure of 76,000 volts between adjacent turns, and the coils in the body of the

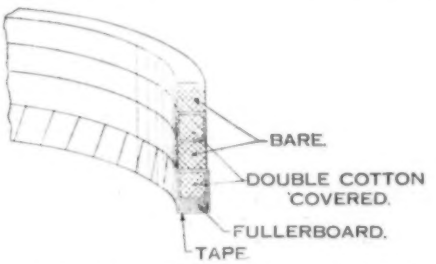


Fig. 3.—Section of One Turn of L.V. Winding.

winding 35,000 volts; as the test pressure was applied for a period of approximately three seconds, whereas the usual high-frequency surge that occurs on a high-voltage transmission line is of only a few cycles duration, these results indicate a high factor of safety. The normal working pressure between adjacent turns is only 70 volts.

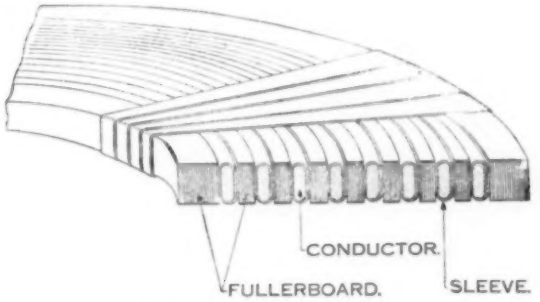


Fig. 4.—Section of H.V. Disk Coil.

Every wire throughout the transformer is exposed to oil. Arranged concentrically, the l.v. winding being next the core, the insulation between the h.v. and l.v. windings consists of four concentric bakelised paper cylinders, spaced from the windings and from each other by vertical fullerboard strips, thus forming oil

ducts between adjacent strips. The top and bottom ends of the h.v. windings are insulated from the yokes by bakelised paper washers and blocks which give the necessary creepage distance. Each of the four sets of this insulation, two on each leg, is bakelised into a solid mass, and between the two columns of coils is a vertical barrier of insulation which allows a clear oil duct on

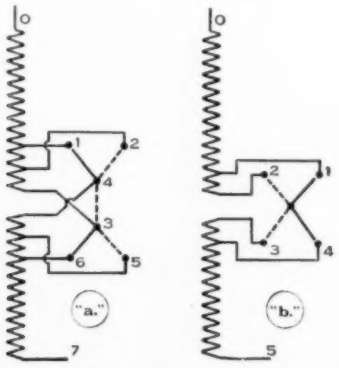


Fig. 5.—H.V. Tappings; (a) As Adopted, (b) Usual Method.

each side, from the barrier to the winding. When completely assembled, the windings were clamped down and subjected to heat treatment for several days to allow shrinkage, approximately 10 per cent. of the original height of the column being taken out in this manner.

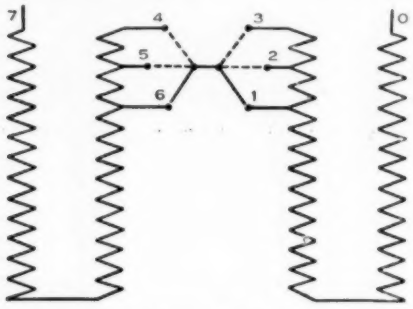


Fig. 6.—Low-voltage Tappings.

Three different high voltages are provided for, and for each tappings are taken from both columns of coils in order not to unbalance the two limbs; the tappings are located in the middle of the column of coils in the usual way, but, in addition, a very interesting feature is in-

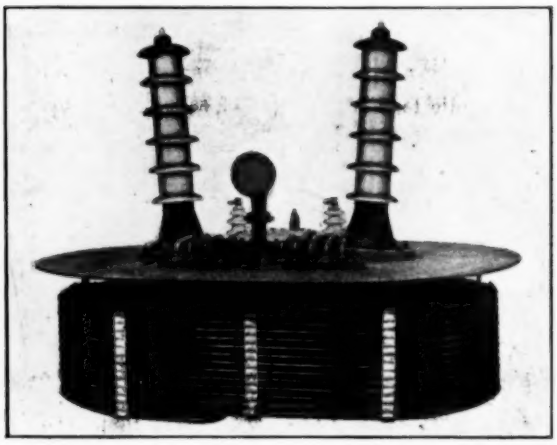


Fig. 7.—Water Cooling Coil.

corporated, fig. 5 (*a*). For each voltage a tapping is taken from the winding on each side of the centre line of the column, and connected together in the manner shown, resulting in the two small sections of the winding being connected in parallel, which arrangement maintains the magnetic centre of the winding under any connection. The scheme also has another very valuable feature that is made clear by fig. 5 (*b*), which shows the usual method of connecting tappings; with that arrangement every connection, except the one for the maximum voltage, results in an idle portion of winding, and a high-voltage surge coming into the transformer might possibly travel through the winding until it reached the tapping point where a certain portion of it would pass straight along through the idle winding to the dead end where it would be reflected and, on the return path, its damaging effect might actually be increased. With the new scheme of connections, fig. 5 (*a*), the whole winding is always in circuit, and there are no points from which

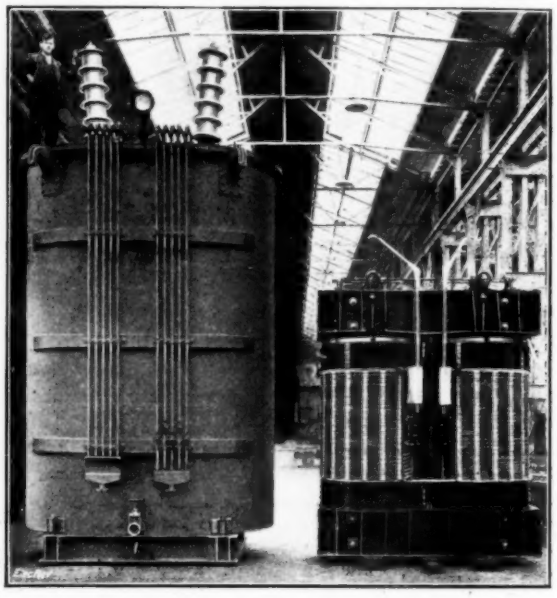


Fig. 8.—One of the 12 Transformers at Stafford.

it is possible to get any reflected wave. This arrangement necessitates twice as many tappings per voltage as would otherwise be necessary, but the advantages gained are thought to be worth while on a big high-voltage transformer.

The two l.v. coils are connected in series and three voltage tappings are arranged symmetrically on both coils, as shown in fig. 6. The connections for the various combinations of tappings are made by copper bars situated above the top yoke. An oil expansion vessel is mounted on the tank side and connected to a calcium chloride breather, and in order to provide a safety valve in the event of a sudden increase of pressure in the main tank, the cover is fitted with a funnel-shaped pipe having its outer end closed by a thin sheet of copper. The oil is cooled by means of a water coil suspended from the underside of the tank cover, in the manner shown in fig. 7. This coil is made of solid-drawn copper tube with sleeved and brazed joints, and the separate turns are supported in castings of an aluminium alloy; the external piping can be seen in fig. 8, and in the manifold is a device for closing an electric circuit for operating an alarm should the water supply fail.

The l.v. bushings are made entirely of porcelain, and the h.v. bushings are of the usual condenser type, with the portion outside the tank encased in a series of porcelain rain shields which give suitable protection for outdoor service. When dry these bushings would flash over at approximately 350,000 volts; under rain conditions the corresponding flash-over pressure would be 250,000 volts.

A dial thermometer is mounted on the side of the tank, the bulb being inside the tank, and because of the climatic conditions in Bombay the transformers have been designed for a comparatively low temperature rise. On the basis of the standard B.E.S.A. rating for water-cooled transformers, which permits a rise of 65 deg. C. measured by resistance and corrected to the instant of shut down, the output of each would be 12,500 kVA. making the capacity of each three-phase bank 37,500

kVA, or the total of the sub-station 150,000 kVA. On the over-potential test 2.2 times the normal voltage was developed in the winding for one minute, after which the voltage was reduced to 1.65 times normal for five minutes.

The weight of each core with windings is 46,000 lb., that of the tank complete with all its fittings, 26,000 lb., and each unit requires 4,000 gallons of oil weighing 35,000 lb.; thus, the total weight of the complete transformer is 48 tons. The floor space occupied by the tank is 11 ft. by 8 ft.; the height over the cover is 16 ft., and over the bushings 22 ft.

An Artificial Silk Factory.

Special Plant for the Provision of Electrical Energy and Process Heat.

THE opening of the new artificial silk factory, Python Mill, Littleborough, to which we referred in our last issue, represents an important advance both in the artificial silk industry and in the development of electrical generating plant for factories wherein electrical energy is required for power, and heat for process work. The production of the new fabric lends itself particularly to the use of such plant, and some particulars gathered during a visit to the Python Mill may prove of interest to our readers.

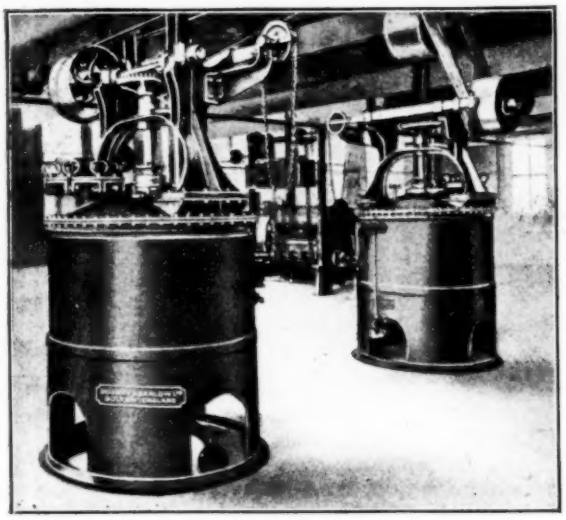


Fig. 1.—"Viscose" Mixers.

The works have been equipped with up-to-date machinery for the manufacture of the silk by Messrs. Dobson & Barlow, and with a modern power plant and a heating and ventilating system throughout the factory by the Metropolitan-Vickers Electrical Co., Ltd. The standard process for producing "Viscose" silk has been employed, a brief description of which will probably add to the interest of the electrical side.

Wood pulp, which is received in sheet form, is first steeped in a caustic soda solution and then pressed out until the weight of the mixture is about three times that of the original pulp. The sheets are then torn up into fine crumbs by machines fitted with steel teeth, and the resultant preparation is stored away for some time, during which further chemical change takes place. The material is next treated with carbon disulphide in slowly-revolving churns, or "viscose" mixers, fig. 1, after which it has a sticky, plastic appearance. It is then dissolved in a second caustic solution, resulting in a treacle-like brownish liquid or "viscose." This is then subjected to a series of filtering operations, after which it is forced through minute holes and "fixed" into gelatinous filaments in a bath of sulphuric acid. The filaments are pulled out of the bath by means of a roller and fed into a rapidly-revolving cylindrical box, where they are twisted into a thread which is laid by centrifugal force on the inside of the box. It is then wound into a skein and finally treated by a number of processes, such as washing, drying, desulphurising, bleaching, and souring, before it attains the lustrous appearance of the final product.

One of the most important features of the above processes is the control of the atmospheric temperatures inside the various rooms; and to heat the rooms as economically as possible, a scheme has been devised for obtaining the necessary heat from the condensing water used in connection with the power plant, which is normally dissipated into the atmosphere by the cooling tower. The hot water is passed through a series of air heaters of the Metropolitan-Vickers Co.'s manufacture and patent.

Every machine or group of machines throughout the mill is electrically driven by energy from the power plant. Three-phase motors are employed in all cases, 3-core cables of the bitumen-sheathed type being run direct to the driving points from the distribution centres. Fig. 2 shows some of the spinning machines; these are driven by B.T.-H. fully-enclosed motors. Over 50 motors have been supplied for the mill by this firm, varying from 2 to 40 h.p. The smaller machines are equipped with star-delta starters, while the larger ones are controlled by means of auto-transformer equipment.

As already indicated, the power plant was specially designed to meet the demand for large quantities of steam required for process work in the mill. The generating plant consists of two turbo-alternators of 1,000 kW and 100 kW capacities, which supply electrical energy to the factory at 440 V, 3-phase, 50 cycles. The large turbine, fig. 3, is one of the M.-V. Rateau impulse type, running at 4,500 r.p.m., and geared down to 750 r.p.m. The steam is exhausted into a M.-V. multi-jet condenser, fig. 4, which is fitted with a Le Blanc rotary valveless dry-air pump and a centrifugal hot-water extraction pump mounted on one shaft and driven by a squirrel-cage motor. The alternator and exciter are driven through double-helical single-reduction gearing. The turbine has two pass-out branches, one bleeding steam at 40 lb. per sq. in., abs., and the other at 140 deg. F. (19 in. vacuum). The first pass-out, 40 lb., delivers steam to the factory for such operations as drying and humidifying, while the 19-in.

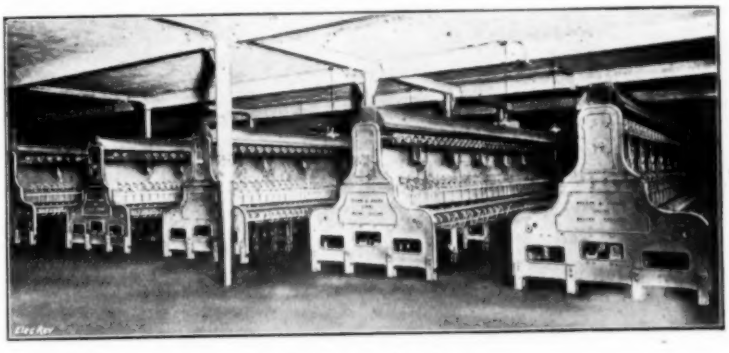


Fig. 2.—Spinning Machines.

vacuum steam is used for the heating of washing water, which is required at 120 deg. F.

The 100-kW turbine is of the back-pressure type, running at 7,500 r.p.m., and driving the alternator and exciter through reduction gear similar to that of the large machine, at 500 r.p.m. It is non-condensing and exhausts against a back pressure of 60 lb. per sq. in., abs. The exhaust steam is used for special drying and bleaching processes. Normally both turbines are running at the same time, and the load taken by the 100-kW set varies according to the demand in the factory for 60-lb. steam. Both turbines are fed with steam at 170 lb. per sq. in. and 150 deg. F. superheat. The steam is provided by four Lancashire boilers equipped with Green economisers and superheaters. Three of these boilers were already installed in the mill when it was taken over for its present use. These have been reconditioned and a fourth boiler installed to meet the requirements of the new generating plant. The boiler-plant work was sub-contracted to Messrs. Hewett & Kellett. In order to provide for the installation in the future of high-pressure water-tube boiler plant, the turbines are designed for working on steam conditions up to 250 lb. per sq. in. (gauge) and 250 deg. F. superheat.

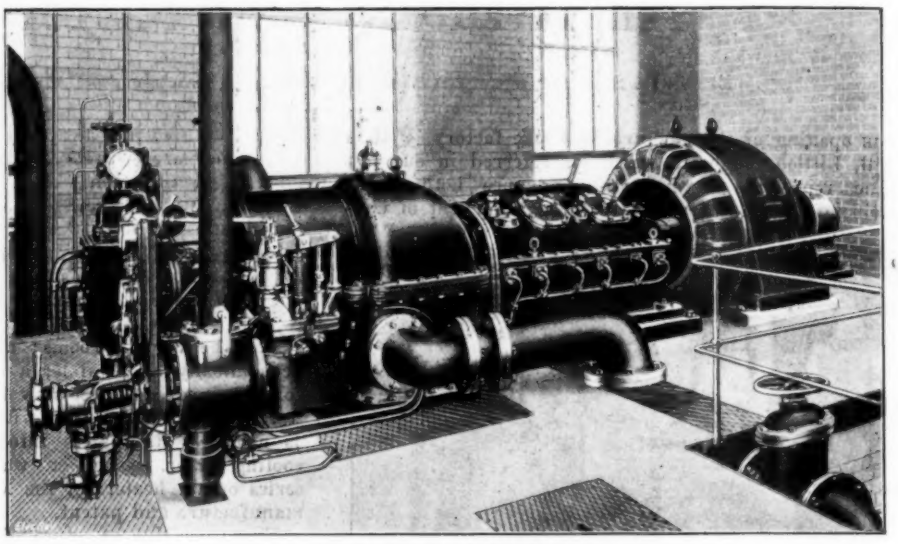


Fig. 3.—Geared Pass-out 1,000-kW. Turbo-generator.

When it was first decided to launch the new concern, much consideration was given to the question whether power plant should be put down or a supply of electricity taken from the public mains. As a result of their decision to install their own plant, the directors of the company are confident that a saving of £10,000 per annum will result.

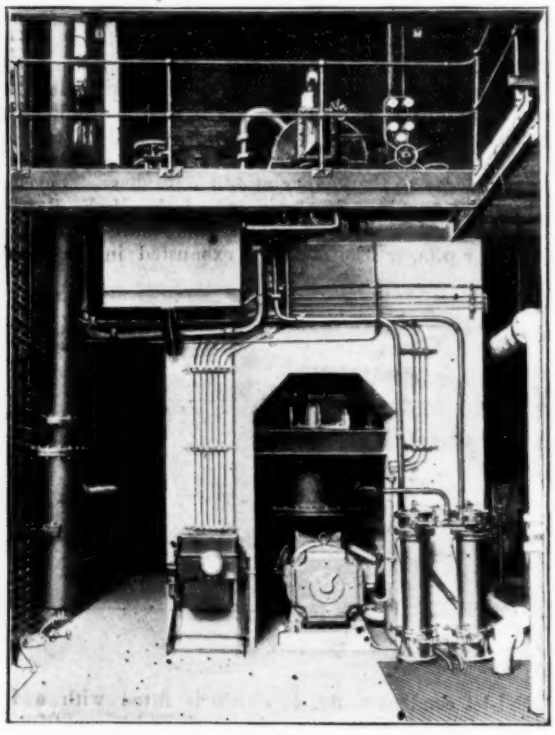


Fig. 4.—Turbine Condensing Plant.

Municipal Trading.

The Scottish Point of View.

By WALTER FINLAY, W.S.,
Secretary of the E.C.A. of Scotland.

WHILE the proceedings on the various private Bills which were recently before Parliament obtained considerable publicity in the electrical Press, very little has been heard of the negotiations which have taken place subsequent to these Bills in connection with the suggestion that the problem of municipal trading might be dealt with in the Electricity (Supply) Bill.

In certain quarters there was a feeling that an endeavour might be made to settle the controversy by agreement, and an informal private conference of various trading associations was held, at which the contractors' representatives formulated a scheme on which they would recommend that the Contractors' Associations should concur in trading powers being granted to municipalities. The main lines of the proposals were that local authorities should have power (1) to sell electrical appliances at retail prices, and (2) to contract for installation work, but that such installation work should be executed by a contractor independent of the municipality. These proposals would have enabled local authorities to arrange for installation work and to charge for it either by immediate payment or by hire-purchase agreements. At the same time, they would avoid the necessity of setting up large municipal staffs for direct labour.

Another informal conference of the same bodies along with representatives of the municipal engineers was held at a later date, when the contractors' proposals were formulated, but they were absolutely rejected by the municipal engineers, the latter insisting on complete powers, including installation powers by direct labour. Every possibility was explored, and the suggestion was made that if authorities were granted full powers, the unreasonable exercise of them might be prevented by a Joint Advisory Committee set up to advise the parties on the exercise of the powers. The municipal representatives forthwith tabled a draft clause containing the proposals. It was agreed that without prejudice to their opinions, representatives should obtain the views of their associations on the proposals made, and that these views should be considered and discussed at a later meeting.

The Electrical Contractors' Association of Scotland duly considered these proposals, but the Board unanimously came to the conclusion that it would be quite impossible to restrain the unreasonable exercise of the definite powers proposed by the efforts of any advisory committee, if a local authority was determined to use

the powers. It was further of the opinion that no case had ever been made out by municipalities for powers to carry out installation work by direct labour, and that it would be placing itself in a false position if it acquiesced in any way in such powers being granted. In addition, it was satisfied that power for direct labour was not in the interest of the general body of ratepayers, as it might lead to the setting-up of large municipal staffs which might tend to increase the already large burden of local taxation. It therefore resolved to do all that was possible to oppose such powers being granted. Owing to the railway strike, a Scottish representative could not attend the subsequent conference, but the views of the Scottish Association were clearly communicated to the conference in a full letter, and it was intimated that the Scottish Association retained a free hand to represent and act as it thought right on the whole question.

It is understood that the general terms of the proposed clause on the lines suggested were approved by the other associations, but it is believed that an actual clause for submission to the Parliamentary Committee was never definitely agreed.

The Scottish Association gave the whole question detailed consideration, and came to the conclusion that it was its duty to take steps to bring its views before various Members of Parliament who were serving on the Special Committee dealing with the Electricity (Supply) Bill, and it was ultimately decided that clauses should be submitted as an amendment to the Bill containing the original proposals for powers as formulated at the initial conference. Sir Philip Dawson and Mr. Hannon ultimately put down the following amendment with the approval of the E.C.A. of Scotland:—

It shall be lawful for the council of any local authority being authorised to supply and supplying electrical energy to expend money upon the wiring and fitting, and to supply with wires, fittings, motors, and apparatus the premises of their consumers or their prospective consumers, and to sell such apparatus at full retail prices to such consumers, and to enter into and carry into effect agreements and arrangements with respect thereto, and to make such charges therefor as they may think fit.

Provided that the local authority shall not manufacture any materials or appliances, nor shall they sell any materials or appliances to the trade, save where there is a contractor of whom the consumer, or prospective consumer, is a customer, or prospective customer, in which case they shall sell to the contractor at trade price or at such other price as may be mutually agreed. The local authority shall not themselves execute any wiring of private property or undertake the supply of materials therefor except between the main of the authority and the consumer's meter, but they may enter into contracts with an electrical contractor for the execution of such wiring of private property including the supply of the necessary materials provided that the contractor acts independently of the local authority in the execution of the contract.

Provided that—

(*a*) The local authority shall so adjust the charges to be made by them for any such fittings or for the fixing, repairing, or removal thereof as to meet the sum properly chargeable for the costs and expenses incurred by them under the powers of this section in connection therewith (including interest upon moneys borrowed for those purposes and all sums applied to sinking funds for repayment of money so borrowed);

(*b*) The sums properly chargeable and received by the local authority in connection with the purposes in this section in each year (including interest and sinking fund) shall be separately shown in the published accounts of the electricity undertaking of the local authority for that year so as to show complete and proper trading and capital accounts.

On an examination of the various amendments as they were published, it was found that there were several amendments dealing with the municipal trading problem. The first substantially consisted of the L.C.C. clauses; this was followed by an amendment which suggested the deletion of the words "or sell" from Clause 23 of the 1919 Act, which would have had the effect of giving Corporations power to sell and also to carry out installation work. Then came Sir Philip Dawson's amendment above recorded, and ultimately an amendment which it is understood was suggested by the Incorporated Municipal Electrical Association, which was intended to confer full trading powers including installation powers by direct labour and to permit of the setting-up of a Joint Committee which, however, was to be nominated by the Minister of Transport and was to include local authorities, persons engaged in the business of making or selling fittings, and consumers.

These amendments were all really of the nature of additions to the Bill, and not amendments of the original clauses of the Bill. When the last clause of the Bill was reached, the Attorney-General, on behalf of the Government, suggested that, to avoid delay, members responsible for additional amendments should withdraw them so as to enable the Bill to be passed this session. In view of the Attorney-General's suggestion, Sir Philip Dawson withdrew his amendment, but when the later amendment was reached, proposing full powers, it was duly moved by its promoters, and a debate and vote took place, as has already been recorded, the amendment being defeated by seventeen votes to eleven.

One very unsatisfactory feature of the debate on this clause was that it transpired that members of the Committee had been advised by letter by some of the promoters of the clause that the clause had been approved by all the associations interested, including the E.C.A. of Scotland, and actually members were asked in the name of these associations to support the clause. There was absolutely no warrant for this, and it is felt that such action was far from fair propaganda.

Sir Philip Dawson requested that the various branches of the electrical industry should consider whether in view of the fact that his amendment proposed to confer on all municipalities a large proportion of the powers they desired, agreement could not be come to that such amendment might be adopted as an agreed policy.

A further conference was held on July 19th, but it was then ascertained that the municipal engineers were as determined as ever, despite their reverses, to try and obtain full trading powers. The E.C.A. of Scotland, notwithstanding the fact that the Parliamentary Committee on the Bill had decided in its favour and that no powers were included in the Bill, is still willing that the modified powers should be included in order that a settlement of the controversy may be arrived at, and it feels that it is only right that all those who are interested in the electrical trade should know that the contractors have made definite constructive proposals for a settlement, that the Incorporated Municipal Electrical Association can obtain by agreement complete trading powers save power for direct labour, and that it is not taking advantage of the opportunity offered. The suggestion has been made that the Scottish contractors will not concede anything. They feel that in conceding sales powers for appliances and the right to make contracts for installation work, 75 per cent. of the municipal claims have been conceded, and that if anyone is uncompromising in the matter, it is the municipal engineers.

It would be an extraordinary thing for Parliament at the present time to be taking away from local authorities the power to spend money, as it is doing now in connection with Boards of Guardians, and at the same time throw at the heads of local authorities power to engage further large municipal staffs. The country is suffering to-day from the burden of the large staffs of civil servants which were set up during the war. It was easy enough for the Government of the day to engage these staffs, but it comes to be a very difficult matter when their reduction has to be dealt with. Similarly it would be very easy for municipalities to take on large installation staffs in view of the possible stimulus to the electrical trade that the Electricity Bill may bring, but it will be a very different matter to reduce these staffs if it is found that the Bill does not fulfil all the promises which have been made for it.

In Scotland the contractors are not alone in the views they hold, as these views seem to be almost unanimously concurred in by the wholesale trade and manufacturers throughout Scotland. It has also been ascertained that there are municipal representatives and central-station engineers who think it would have been wise for the Municipal Electrical Association to have taken advantage of the settlement which was within its grasp and not to have taken up such an uncompromising attitude.

D

Electric Resistance Furnaces.

Some Details of Tests of an Installation at Summer Lane, Birmingham.

By W. Y. ANDERSON, A.M.I.E.E., and W. P. CONLY, M.Sc., A.M.I.E.E.

THE electric resistance furnace is ideal for many metallurgical purposes, and is now being widely used in factories both in the United States and in this country. In the United States, where the average price of power in the principal industrial districts is certainly not lower than in Great Britain, something like 80,000 kW of resistance furnaces are in commission, consuming more than two hundred million kWh per annum.

A 60-kilowatt electric furnace of the resistance type, illustrated in fig. 1, has recently been installed at the Summer Lane power station of the City of Birmingham Electricity Supply Department, having a heating chamber 60 in. long by 40 in. wide by 20 in. high. It was manufactured by the Electric Furnace Co., Ltd., under Wild-Barfield patents.

Invitations to a demonstration were sent out to metal-rolling firms, enamellers, wire drawers, and to all to whom it was considered the furnace would be of interest. The results were most encouraging. Nearly all the large firms of repute in Birmingham sent representatives, and in most cases the managing directors or works managers themselves took advantage of the invitations. Firms as far afield as Coventry, Manchester, Liverpool, and Bristol also availed themselves of the opportunity to see the demonstration.

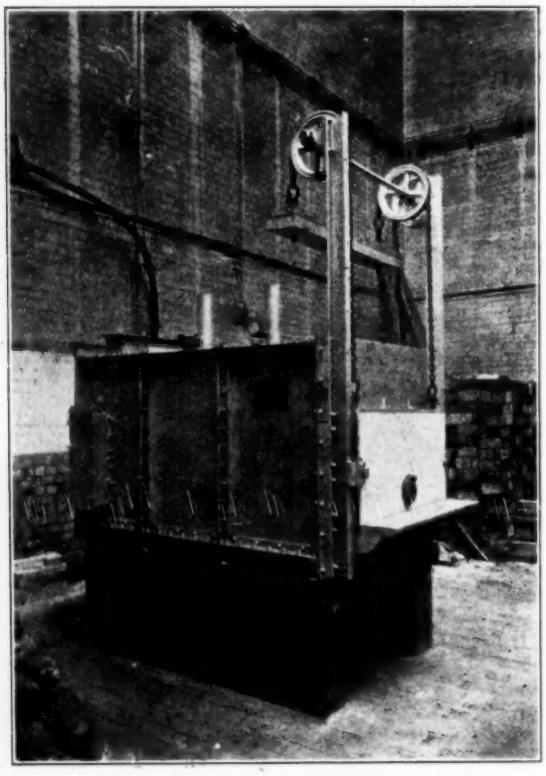


Fig. 1.—A 60-kW Electric Resistance Furnace at Birmingham.

Many of the visitors brought metal to be annealed, or enamel to be baked, and it was possible to carry out exhaustive tests on the annealing of mild steel, stainless iron, brass, copper, silver, plated metal, pure nickel, nickel silver and aluminium, and also on vitreous enamelling, carburising, drying and baking.

The body of the furnace erected at Summer Lane is composed of mild steel sheets and angles bolted together to form a self-contained unit of robust construction. The internal face of the chamber is constructed of high-grade refractory bricks of a special design, having grooves in which the resistor element is carried. The backs—or rather the ends—of these bricks are also grooved to take supporting ties which securely bind together and carry the bricks. The ties are of a non-corrosive iron alloy, and will apparently operate continuously at the designed temperature without corroding or oxidising. Between the special bricks and the furnace shell is a layer of high-temperature heat-insulating brickwork. The resistor units are composed of high-grade nickel-chrome wire spirals, which are carried throughout the length of the furnace in the grooves of the special bricks. These resistors are arranged on both sides and the top of the heating chamber. All the electrical connections to the resistor wires are made at the back of the furnace, which can be removed for the inspection or renewal of the spirals.

The front of the furnace carries guides for the charging door and door-balancing gear. A small inspection hole with a cast-iron cover is provided in the charging door to enable one to inspect the metal undergoing treatment. Two flues fitted with butterfly dampers are built in the top of the furnace for carrying away any fumes which may arise when carburising.

The automatic temperature-control unit consists of a thermo-couple in the centre of the furnace and a special indicating pyrometer with a calibrated temperature scale and a pointer to indicate the furnace temperature. Underneath this pointer is a second indicator which may be adjusted to any predetermined temperature at which it is required to operate the furnace. When the first pointer reaches this point, a small thermo-couple in the instrument becomes heated and energises a special relay. This relay in turn energises a main relay which excites the closing coil on the contactor switch, thus breaking the circuit to the furnace. As the temperature in the furnace falls, a reverse cycle of operations takes place, and the contactor switch makes the main circuit to the furnace again. The variation of temperature by means of this equipment is about 5 or 6 degrees Centigrade above or below normal, which (for average working temperatures) means a variation of less than 1 per cent. A time switch is incorporated with the control instruments, and can be set so that the furnace will be switched on or off at any predetermined time.

To guard against failure of the regulating devices, two silver fuses have been inserted in the furnace circuit to protect the resistors. These are placed in the heating chamber and will blow at about 1,000 deg. C. Red tell-tale lamps show when either of these fuses has blown.

The manufacturers claim the following advantages for this type of furnace:—Absolute control of temperature, low labour costs, improvement of quality of the products, lower oxidation losses, cleanliness and better working conditions in the furnace and shops, smaller working space required for a given output, and no material rejected on account of stains or discoloration.

Where a large quantity of articles is to be dealt with, the electric furnace can be designed so that a continuous cycle of operations may be easily maintained by automatic control in place of labour. Further, a pre-heating chamber may be installed where the heat stored in the material which has received treatment in the furnace will be used to heat the incoming charge, thus effecting a great saving in consumption costs.

In comparing costs of a coal-fired furnace with an electric one, such items as cartage of coal, the handling of ashes, repairs and replacements to the furnace, space occupied for the storage of coal, &c., should be taken into consideration. The cost of consumption of the

electric-resistance furnace can be divided into three sub-sections:—

(*a*) Units consumed in heating the empty furnace from cold to working temperature.

(*b*) Specific heat units consumed in bringing the charge up to temperature throughout.

(*c*) Radiation losses.

(*a*) Extensive tests were made to find the energy consumed and time taken to bring the furnace up to temperature. Readings were taken every 15 minutes and the results plotted in fig. 2. Curve 1 shows the variation of the rising temperature with time, curve 2 represents the variation of the units consumed with time, and curve 3 gives the rate of cooling of the furnace with door closed, but with no charge. The scale of the time for the rising curve is four times that of the cooling curve. This is to make as open a curve as possible.

It will be noticed from curves 1 and 2 that the furnace takes 2 hr. 52½ min. to rise from 30 deg. C. to 950 deg. C. at an expenditure of 148 kWh, *i.e.*, 51.5 kWh per hour. The cooling curve 3, however, shows that in 12 hours the furnace, while empty, falls to 265 deg. C.; thus if the furnace were switched off by clock switch at 5.30 p.m. and switched on again at 5.30 next morning, the temperature would be up to 950 deg. C. again at 7.54 a.m., with an expenditure of 124½ kWh.

If it is assumed that the furnace is at 250 deg. C. each morning, and is switched off each night, the following units will be required each day to bring the furnace up to the correct working temperature for various metals:—

TABLE 1.

Metal	Working temperature, °C.	Time taken to raise temperature of empty furnace from 250° C. Minutes.	Electricity consumed in raising temperature. kWh.
Vitreous baked enamel	900	125	106
Iron and mild steel ...	800	96	82.5
Stainless iron	780	90	77.5
Silver, nickel, and nickel-silver	750	84	72
Copper, brass, and plated metal ...	650	60	51.5
Aluminium	535	37.5	32

(*b*) The units required to raise the charge from cold to working temperature must also be added to that proportion of the above consumption units allocated to each charge throughout the day. The number of kWh required is a function of the degrees of temperature through which the charge is raised, and of the specific heat of the metal.

B.th.u. $= (T_2 - T_1) \times$ spec. heat $\times$ wt. in lb.,

where T_2 = working temperature in degrees Fahr.

T_1 = starting temperature in degrees Fahr.

The starting temperature T_1 may be taken as 70 deg. F. in the average rolling mill.

The number of kWh required per cwt. will therefore be—

$$(T_2 - 70) \times \text{specific heat} \times 112/3{,}411 \text{ kWh.}$$

Table 2 gives units required to raise various metals to the annealing temperature (the small amount of heat lost when the furnace door is opened has been taken into account in compiling this table).

TABLE 2.

Metal	Working temp. °C.	Units required to anneal metal 1 ton	15 cwt.	10 cwt.	5 cwt.	3 cwt.	1 cwt.
Iron and mild steel	800	108·5	82	55	28·5	17·5	6·33
Stainless iron ...	780	108	81·5	54·75	28	17·3	6·3
Silver	750	50	38	26	14	9	3·5
Nickel	750	95	62	48·5	25	15·5	6
Copper and brass ...	650	70	53·5	360	18·5	11	4
Aluminium ...	535	135	111	69	36	22·5	8·5

(*c*) Several tests were made to discover the units required to maintain a steady heat at any given temperature.

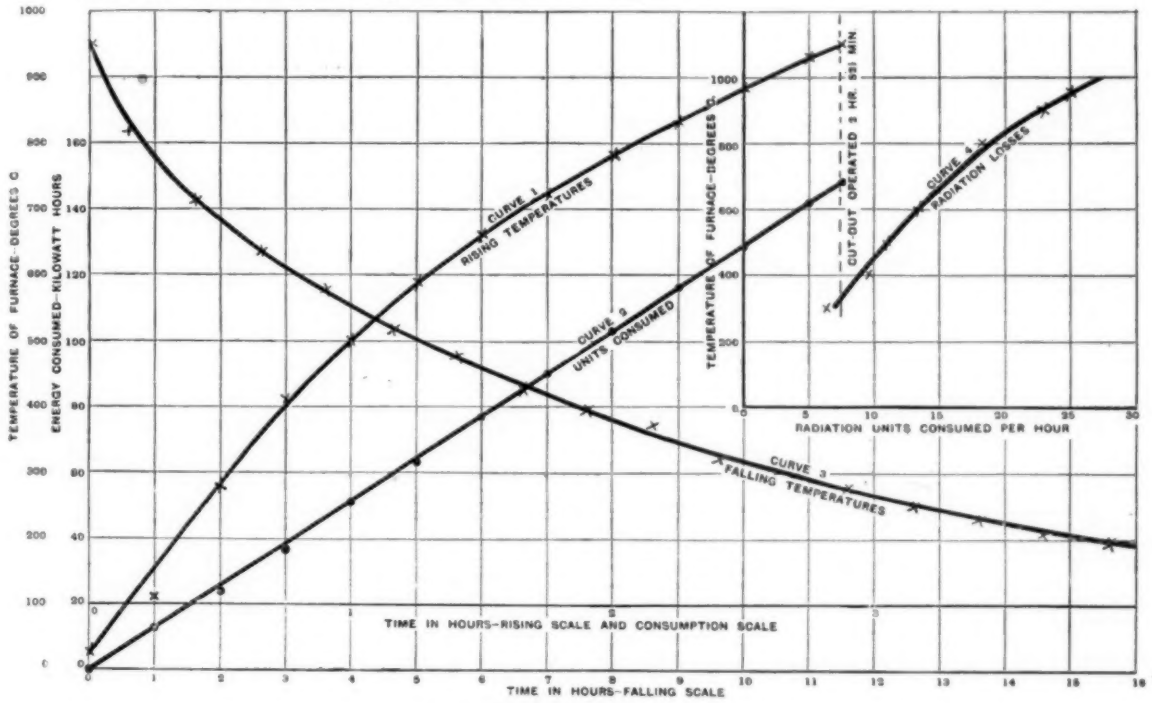

TEMPERATURE OF FURNACE-DEGREES C
ENERGY CONSUMED-KILOWATT HOURS
CURVE 1 RISING TEMPERATURES
CURVE 2 UNITS CONSUMED
CURVE 3 FALLING TEMPERATURES
CURVE 4 RADIATION LOSSES
CUT-OUT OPERATED 5 HR. 55½ MIN.
TEMPERATURE OF FURNACE-DEGREES
RADIATION UNITS CONSUMED PER HOUR
TIME IN HOURS-RISING SCALE AND CONSUMPTION SCALE
TIME IN HOURS-FALLING SCALE

Fig. 2.—The Results of the Tests.

The furnace was run up to temperature and the units noted to maintain that temperature over a given period.

Table 3 gives radiation units for various temperatures, and these results are plotted on fig. 2, curve 4.

TABLE 3.

Temperature, deg. C.	Radiation units per hour.	Temperature, deg. C.	Radiation units per hour.
300 ...	7	700 ...	16
400 ...	9	800 ...	19
500 ...	11	900 ...	23
600 ...	13·25		

The manufacturers state that by means of extra lagging outside the furnace the radiation losses at all temperatures could be cut down by half. Once the furnace has been raised to working temperature, the total units required to anneal the metal will be the sum of (*b*) and (*c*).

The cost per ton will depend upon the amount of charge put into the furnace. If there is a small amount, there will be a larger radiation loss in proportion to the amount of metal. On the other hand, however, if a large charge is put in the furnace, the time will be longer and the radiation will be greater. There must, therefore, be an optimum weight of charge of any particular metal. This can only be found empirically.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Railway Electrification Contract.—The General Electric Co., Ltd., has recently received an order for a high-speed electric passenger locomotive in connection with the electrification of the Great Indian Peninsula Railway. This locomotive is for service on the main lines from Bombay to Igatpuri, and Bombay to Poona, both of which lines pass over the Ghats. The locomotive is of the 4-6-4 type, having three main driving axles arranged for individual drive and provided with a guiding bogie at either end. It develops 2,250 h.p. on the one-hour rating. Each main axle is driven by a twin-armature motor through a flexible gear wheel, secured to a quill surrounding the axle. Torque is transmitted from the quill to the axle by means of a special type of flexible drive mechanism, which permits of relative motion between the axes of the axle and quill, allowing the motor to be mounted rigidly in the locomotive frame, and reducing the hammer blow on the track to a minimum. The control apparatus is of the electro-pneumatic type, comprising contactors and cam switches. The maximum speed is 85 m.p.h.

Yorkshire Agricultural Show.—At the Yorkshire Agricultural Show, at Harrogate on July 21st, 22nd, and 23rd, Messrs. Taylor & Parsons, Ltd., general ironmongers, of Bradford, had a display including electrical household equipment. Another interesting household exhibit was that of the "Thor" electric washing machine, by the Hurley Machine Co. Electrolux, Ltd., showed refrigerators, floor polishers, and cleaning outfits. The Singer Sewing Machine Co. had on view a number of electrically-driven sewing machines for household use and sewing machines for use in connection with agriculture. Mr. George Newby, of Harrogate, showed small electrical devices for the home, and Messrs. Broadbank & Sons, Harrogate, exhibited radio apparatus. Other electrical exhibits were: England, Robinson & Co., Ltd., Harrogate, radio sets, vacuum cleaners, fires and lamps; Petters, Ltd., oil engines and "Petter" electric lighting set for country estates; Kohler Co., Ltd., 1,500-W and 800-W automatic electric generating sets; Messrs. R. Falshaw, Ltd., Harrogate, "Petters," "Lister", and "Pelapone" electric light plant, "Tudor" storage batteries for house lighting and accumulators for wireless sets, vacuum cleaners, &c.: Messrs. Robert Boby, Ltd., electric cold-storage larder cabinet, &c.; and Mr. H. C. Slingsby, electric trucks, tractors and engines.

Portuguese Tariff Concession.—As a means of encouraging the development of the home coal-mining industry, the Portuguese Government is to permit a reduction of 90 per cent. of the import duties on certain mining equipment not economically produced in Portugal, including "thermo-electric plant required by mine owners." The concession will operate for 10 years.

Co-operative Coal Selling.—The Secretary for Mines announces that the following have been appointed to serve on a committee which has been set up to inquire into and report upon the desirability and practicability of developing co-operative selling in the coal mining industry and to make recommendations:—Sir Fredk. William Lewis, Bart. (chairman), Mr. John R. D. Bell, Sir Thomas S. Catto, Bart., Rt. Hon. Vernon Hartshorn, M.P., Sir Hugo Hirst, Bart., Sir David R. Llewellyn, Bart., Mr. A. K. McCosh, Sir Alfred M. Mond, Bart., M.P., Sir W. Harry Peat, K.B.E., Mr. Frank B. Varley, M.P., Mr. J. A. Warriner. The Secretary to the Committee is Mr. E. Fudge, of the Mines Department, Dean Stanley Street, Millbank, S.W.1.

Morecambe Council and Local Contractors.—At a recent meeting of the Morecambe Electricity Committee a letter was read from the local electrical contractors suggesting that the department was exceeding its powers with regard to municipal trading, and asking for the opportunity for a deputation to meet the Committee. The Town Clerk replied asking for specific instances of alleged improper trading, which were not forthcoming. The Committee denies that any transaction has taken place in the department which exceeds the powers of the Corporation, and under these circumstances it is not prepared to meet a deputation.

Social Events.—On July 16th, a smoking concert was arranged at St. George's Restaurant, Liverpool, by the Campbell & Isherwood Amateur Football Club. Over 100 members attended, and medals were presented by the president, Mr Tattersall, to members of the team. The club was only formed at the commencement of last season, but it finished at the head of the Central Amateur League. During the evening the president was presented with a framed photograph of the club.

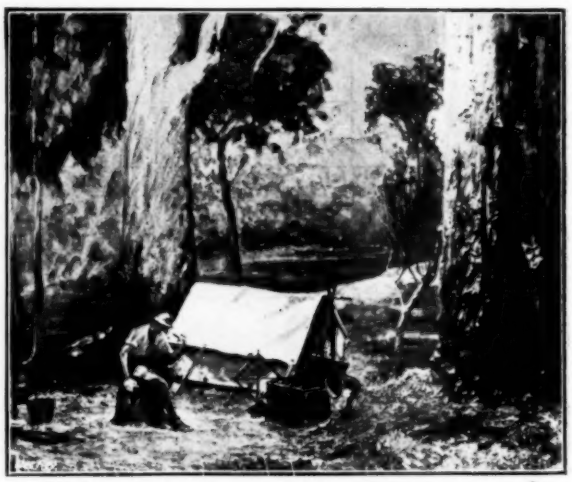
Ellison's Athletic and Recreation Club held its annual sports at the works' recreation ground on July 17th. The attendance was exceptionally good, considering that all events were only open to employés. Prizes were given by heads of departments and friends to the extent of £35, which were shared in 27 events. After the sports dancing was carried on until dusk. Mrs. Alfred Ellison distributed the prizes.

The Census of Production.—In consequence of the delay of certain firms in making their returns, there is a possibility that the publication of the Census of Production will be seriously delayed. It is understood that the Board of Trade takes so serious a view of the delay that a series of prosecutions is to be instituted against offenders. The particulars required relate to the year 1924, and for some months the Board of Trade officials have been kept busy writing to the firms which have neglected to make their returns and pointing out that offenders are liable to fines in respect of each day's delay.—*Financial Times.*

Wages in the Engineering Industry.—As we briefly reported in our last issue, the Amalgamated Engineering Union and other unions in the engineering industry, have decided to postpone their claim for an increase of 20s. per week until more settled conditions prevail. This decision was reached at a conference held between the Executive of the A.E.U. and the London District Committee. The latter had decided to press forward its claim as the result of a ballot in favour of strike action, but Mr. J. T. Brownlie expressed the executive's opinion that the present time was not a propitious one. The employers had pointed out that the general strike had caused further loss to the industry, making the possibility of an advance even more remote.

Exhibition Award.—A first award of merit has been given to HOLOPHANE, LTD., for its exhibit at the recent New Zealand and South Seas Exhibition.

A Melbourne Wireless Exhibit.—The accompanying illustration is picked out from a photograph of an exhibit arranged by Messrs. Noyes Bros. Pty., Ltd., at the recent Melbourne Wireless Exhibition. Included in the exhibit, as the main object of interest linked up with Colonial life, is a six-valve set constructed from the Igranic "super het." kit and a "Brown" loud-speaker in service to one living "out back."



A Melbourne Wireless Exhibit.

Employment During June.—Employment in the engineering industry during June declined on the whole. According to the *Ministry of Labour Gazette*, in the electrical engineering branch the percentage of workers unemployed rose from 10.6 in May to 11.3 in June. In the corresponding month of last year the figure was only 5.6 per cent. In the electrical wiring and contracting industry, too, there was increased unemployment, the proportion rising from 10.3 to 15.5 per cent. (8.1 per cent. in June, 1925). On the other hand, there was an improvement in the electrical cable, wire and electric lamp manufacturing group, in which the proportion of unemployed fell from 9.6 to 7.9 per cent. (7.7 per cent. in June, 1925).

A Power Station Guarantee.—The Treasury has expressed its intention of guaranteeing the principal and interest of a loan of £1,000,000, for a period of 30 years, which is being raised by the North Metropolitan Power Station Co. for the construction of a large generating station at Brimsdown, Middlesex. The station, which will at first contain two 20,000-kW sets and the necessary steam plant, will be leased to the North Metropolitan Electric Power Supply Co.

Electricity in Tin Mining.—*The Times* states that arrangements have reached an advanced stage for the issue of a loan in connection with a scheme for the supply of electric power for the development of the tin mines of Perak. The project has the active support of both the Imperial Government and the Government of the Federated Malay States; the former has guaranteed a loan under the provisions of the Trade Facilities Acts, and the latter will hold the share capital of the new undertaking. Reference is made in our "City Notes" to an issue of debenture stock by the Perak River Hydro-Electric Power Co., Ltd.

Wireless Import Trade.—With reference to meetings recently held between committees representing the S.R.M. and the N.A.R.M.A.T., we are informed that at a meeting of the Council of the Wireless Retailers' Association of Great Britain a resolution has been passed to the effect that while the Council approves the general desire to introduce and sell to the public British manufactured wireless apparatus wherever and whenever possible, it nevertheless endorses the attitude of the wholesale section of the trade in demanding freedom from restrictions in respect of the right to handle goods from overseas.

Annual Holidays.—The Chester works of Brookhirst Switchgear, Ltd., will be closed for annual holidays and stocktaking from the evening of July 30th until the morning of August 9th. The offices will be closed on Bank Holiday only.

The works of Messrs. C. H. BYRON & Co., Smethwick, will be closed from July 31st until August 9th.

The West Drayton works of the ANGLO-SWISS SCREW CO., LTD., will be closed from July 31st until August 9th.

Belgian Activity in Australia.—It is reported from Brussels that about a hundred Belgian firms interested in the production of electrical apparatus and machinery, such as telephone equipment, measuring instruments, and motors, are about to make an effort to extend their trade in Australia by opening a joint showroom either in Sydney or Melbourne.

New Italian Company.—A new company has lately been formed in Milan, with a capital of 600,000 lire and the title La Società Credito Elettrica Nazionale, to finance electrical undertakings in Italy.

Trade Announcement.—The business of Messrs. J. and W. B. SMITH, LTD., 15-23, Farringdon Road, E.C.1, has been acquired by Lighting Trades, Ltd., of Garrett Lane, Wandsworth, S.W.18. The businesses will continue to trade as separate concerns.

Catalogues and Lists.—MESSRS. DONOVAN & Co., 47, Cornwall Street, Birmingham.—An illustrated price list of electric fans of all patterns.

VENESTA, LTD., 1, Great Tower Street, E.C.3.—A brochure describing "Plymax," a combination of wood and sheet metal, and its applications.

THE METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Circular No. 1710/7, describing the plant made by the company for the mining industry, with illustrations of work carried out for a number of leading collieries.

MESSRS. W. SISSON & Co., LTD., Elmbridge Road, Gloucester.—A brochure dealing with the company's vertical steam engines, compiled for its Indian agents, Messrs. Worthington-Simpson, Ltd.

THE HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A cardboard cut-out, a coloured poster and adhesive labels designed to encourage the use of radio sets during the summer. Also a showcard advertising the company's batteries for automobile lighting and ignition, and a pamphlet giving details and prices of "Hart" h.t. radio batteries.

THE COVENTRY ELECTRICAL ACCESSORIES, LTD., Conduit Yard, Fleet Street, Coventry.—A blotter advertising the "Ceal" electric iron.

MESSRS. ELLIOTT BROS. (LONDON), LTD., Century Works, Lewisham, S.E.13.—Pages 81-86 of section "A" of the Company's general catalogue, containing illustrated particulars of "miniature" d.c. switchboard instruments.

MESSRS. PHILLIPS & TURNER, Cambridge Street, Birmingham.—A wall card and a price sheet giving particulars of electric lighting fittings, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 745, showing the adaptability of "English Electric" motors to any form of mechanical drive.

MESSRS. J. H. TUCKER & Co., LTD., King's Road, Tyseley, Birmingham.—A price and illustrated pamphlet dealing with adjustable grid boxes for flush mounting.

MESSRS. R. A. EVANS, LTD., Prospect Road, Leicester.—A well-illustrated brochure advertising the company's electric lifts.

THE BRITISH CENTRAL ELECTRIC CO., LTD., 6-8, Rosebery Avenue, E.C.1.—An illustrated leaflet advertising the "Navy" portable inspection lamp and "Koh-i-noor" tape. Priced.

BATTERIES, LTD., Crabbs Cross, Redditch.—A priced and illustrated pamphlet advertising "Nife" (alkaline) motor-cycle batteries.

THE HATTON SUPPLY CO., Hatton, Middlesex.—Two pamphlets advertising the "Sarbolt" aerial insulator.

CROSSLEY BROS., LTD., Openshaw, Manchester.—Publication No. C.103, illustrating and describing the company's new 2- and 3-b.h.p. paraffin engines; also Publication No. 1,003, containing a description of an oil-engine electric power plant at a Scottish cereal mills.

Bankruptcy Proceedings.—D. M. STRODE, 44-50, Osnaburgh Street, N.W., and 6 and 7, Creed Lane, E.C., electrical and heating engineer.—This debtor filed his petition on July 1st, and the first meeting of creditors was held on July 19th, at Carey Street, W.C. In his preliminary examination debtor had stated that before the war he acted as a director of Strode and Co., Ltd. In 1914 he joined up and served throughout the war, being demobilised with the rank of captain. He then returned to his former employment and acted as a director of Strode & Co., Ltd., until it went into voluntary liquidation two years ago. He bought the goodwill, tools, and office furniture from the liquidator for about £300. For the first six months the business proved fairly successful, but it had since fallen away considerably, and after the sheriff had levied execution debtor was advised to file his petition. The debtor attributes his insolvency to bad trade, heavy overhead charges, and lack of working capital. He estimates his liabilities at £4,000, due to 40 creditors, and his assets at £1,800. A resolution was passed for the appointment of Mr. E. H. Hawkins, I.A., 4, Charterhouse Square, E.C., as trustee of the estate. The following are creditors:—

	£		£
Credenda Conduits Co., Ltd. ...	101	Irwin & Jones	30
Best & Lloyd	26	Wansey, Stammers & Co. ...	215
Glover & Co	22	Browns Foundry Co.	29
Imperial Lighting Co	27	Scaife, F.	30
National Radiator Co.	39	Sanders, Wm., & Co.	46
Baxter & Caunter	92	Beeston Boiler Co.	38
Tucker & Edgar	94	Ashby, Warner & Co.	39
General Electric Co., Ltd. ...	135	Simmons, H. W.	32
Westminster Bank	2,082	Boulting, J., & Sons	55
Piggott Electrical Co.	42	Le Bas Tube Co.	30
Lumlys	214	British Steam Specialities ...	25

H. C. HALL, Chapel Street, Penzance, electrical and fancy goods dealer.—The public examination of this debtor was held at Truro Bankruptcy Court on July 19th. Hall stated that he commenced trading in April, 1925, when he took over the business with its assets and liabilities on an undertaking to pay the creditors of the former proprietors 10s. in the £. His deficiency amounted to £470, but he denied that £300 was owing to the bank on account of an overdraft and should be added to his deficiency. He was adjudicated bankrupt in 1896, no dividend being paid, and he was still undischarged, but he did not notify this fact to certain creditors. The Official Receiver suggested that some figures in debtor's statement of affairs were inconsistent. The person who prepared it was his agent acting on instructions. £45 had been offered for the stock, which debtor valued at £75. The examination was closed.

W. J. WARREN, wholesale electrical supplies factor, 66, Victoria Street, S.W.1.—This debtor traded under the style of Coleman & Warren, but states that he never had a partner. The first meeting of creditors was held last week, at the London Bankruptcy Court, when accounts were submitted showing liabilities of £1,728, against assets valued at £164. According to the debtor's statements, he started the business in April, 1923, with a capital of £250, and later borrowed £500 from his wife and brother, both of whom are present creditors. The trading was never successful, owing, as the debtor alleges, to depression in the electrical trade; he has been pressed by creditors for eight months past, and upon an execution being levied about a month ago the business came to an end. The estate was left in the hands of the Official Receiver.

J. G. F. RENNIE, 19, Bridge Street, Andover, Southampton, electrical engineer.—The first meeting of creditors was held recently at the Official Receiver's office, City Chambers, Catherine Street, Salisbury. According to the statement of affairs, the ranking liabilities amounted to £724, against assets of £203, leaving a deficiency of £521. Debtor attributed his failure to the fact that the trade done had never justified his commencing business; he had been losing money from the time he started. The matter was left in the hands of the Official Receiver as trustee of the estate.

F. H. ARMITAGE, electrical engineer, 9, Occupation Lane, Pudsey, Yorks.—First and final dividend of 3s. 0½d. in the £, payable July 28th at the Official Receiver's office, 12, Duke Street, Bradford.

S. C. RAPSON, C. L. BURRILL, and A. J. HEFFER, electricians, trading as "The Suburban Electrical & Maintenance Co." at 2, Plough Yard, Shoreditch, E.—First and final dividend of 2s. 10½d. in the £, payable August 3rd, at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.2.

W. G. H. MORLEY, trading as "George & George," 434, Market Place, Higher Broughton, Salford, electrical contractor.—First meeting held yesterday (Thursday). Public examination, September 16th at the Official Receiver's offices, Byrom Street, Manchester.

P. S. KENNEDY, electrical engineer, trading as "Martin and Co." at 102, High Street, Stoke Newington.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, released June 4th.

S. PATTERSON, electrician, 55, Aberdeen Walk, Scarborough.—First meeting, August 4th at the Official Receiver's office, 48, Westborough, Scarborough. Public examination, August 17th at the Court House, Castle Road, Scarborough.

H. D. DOUGLAS, engineer, radio factor, &c., trading as "H. D. Douglas & Co." at 32, Queen Victoria Street, E.C.4.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1, appointed July 14th.

L. A. WOODHEAD, radio dealer, 25a, Charles Street, Bradford.—Receiving order made July 17th on debtor's own petition.

E. D. S. MUNDAY, electrical engineer, 272, Lake Road, Portsmouth.—First meeting held July 29th. Public examination, August 9th at the Court House, St. Thomas's Street, Portsmouth.

A. L. DYER, Marsh Street, Newcastle-under-Lyme, electrical engineer.—Trustee, Mr. J. D. Turner, 12, Lonsdale Street, Stoke-on-Trent, released July 15th.

H. G. SELLERS (trading as R. Sellers), 72a, Spital Hill, Sheffield, electrical engineer.—Receiving order made July 21st, on debtor's own petition.

H. P. JACKSON, 70, Micklegate, York, cycle and radio dealer.—Receiving order made July 20th, on debtor's own petition.

Company Liquidations.—SHEFFIELD WIRELESS DEPOT, LTD., Norfolk Street, Sheffield.—A meeting of creditors was held on July 22nd, at the Institute of Chartered Accountants, E.C., when the chair was occupied by Mr. H. Cunningham, I.A., of Kings Chambers, Angel Street, Sheffield. No statement of affairs was presented, but the Liquidator reported that the liabilities amounted to £1,744. The assets were estimated to realise £19. The assets were insufficient to meet the claims of the preferential creditors, amounting to £63, and there was a deficiency as far as they were concerned of £44, or a total deficiency of £1,788. One of the directors sub-let the Norfolk Street premises to the company on a quarterly tenancy. The liquidation had taken place owing to the fact that one creditor had levied execution in respect of a debt of over £300. The company was formed on June 11th, 1923, with a nominal capital of £1,000, to take over a business previously carried on by Mrs. Jackson. The directors of the company were Mr. T. H. Jackson and his wife. Mrs. Jackson held 100 shares and her husband 176, and they were all fully paid. There was no information to show what the company paid for the business. The liquidator had not seen the agreement under which the vendor sold the assets of the business to the company. The meeting broke up without any resolutions being passed. The voluntary liquidation of the company will therefore be continued with Mr. Cunningham as liquidator. The following are creditors :—

	£		£
British Thomson-Houston Co., Ltd.	44	Lisenin Wireless Co.	50
Eastick, J. J., & Sons	109	Mullard Radio Valve Co., Ltd....	31
General Electric Co., Ltd. ...	106	Bankers	241
Jackson, T. H.	156	Graham, A., & Sons	37

R. MCKELLEN & CO., LTD., manufacturers of wireless sets, &c., 58, High Street, W.C.—The report of Mr. G. W. Pepys, Official Receiver, upon the affairs and liquidation of this company has been issued to the creditors and shareholders. The winding-up order was made last March upon the petition of a creditor, and accounts have been lodged showing total liabilities of £8,419 (unsecured £8,338), assets valued at £5,645, and a deficiency of £5,201 with regard to contributories. Mr. T. W. Holland, C.A., 9, Bedford Row, W.C., has been appointed liquidator of the company. Mr. Pepys reports that the company was registered as a private company on May 7th, 1925, with a nominal capital of £10,000, divided into £1 shares, to acquire and carry on the business of manufacturers of, and dealers in, cycles and cycle accessories and wireless-telegraph transmitting and receiving sets, formerly carried on by R. McKellen under the style of R. McKellen & Co., at 58, High Street, W.C.1, and, according to the memorandum of association, "to enter into and carry into effect with such (if any) modifications or alterations as may be agreed upon an agreement already prepared and expressed to be made between Roderick McKellen of the one part, and this company of the other part." It is stated that the business of R. McKellen and Co. was the sale of bicycles, wireless instruments, and gramophones on hire purchase. As and when the hire-purchase agreements were executed they were bought by a Major E. Matthews for 70 per cent. of the consideration, less the deposit; thus the firm was provided with funds to carry on business. They further state that the company was formed by arrangement with Matthews to carry on the whole of the hire-purchase business, including collection, and that, in fact, no agreement was ever prepared relating to the formation of the company. The company apparently took over the business as from April 1st, 1925, and, according to a balance-sheet prepared by Hill, as at that date, the liabilities amounted to £1,569 and the assets to £1,096, a deficiency of £473. The company also took over the hire-purchase agreements in respect of which they credited Matthews with a sum of about £3,500. Matthews advanced further sums to the company for the carrying on of the business, which, up to September 30th, 1925, resulted in a net profit of £2,212, according to the audited accounts. Matthews became dissatisfied with the manner in which the business was conducted, and eventually presented the petition upon which the winding-up order was made. The directors attribute the failure to the fact that the company, on the promised support of Matthews (which was not forthcoming) incurred heavy overhead expenses in preparation for a larger business, which the company could not carry out.

INDIA RUBBER PRODUCTS CO., LTD.—Meeting of members August 25th, at 48, Farringdon Street, E.C.4, to hear an account of the winding up from the liquidator, Mr. C. W. Daborn.

LEAD HYDRATE BATTERY CO., LTD.—Meeting of members August 31st, at 94, Old Broad Street, E.C., to hear an account of the winding up from the liquidator, Mr. P. B. Nevill.

POTTERIES RADIO CO., LTD.—A general meeting is to be held on August 26th, at the offices of Messrs. Wilson, Martin and Co., 36, Spring Gardens, Manchester, to hear an account of the winding up from the Liquidator, Mr. F. O. Wilson.

ELECTRICAL STORES (NOTTINGHAM), LTD.—Winding up voluntarily.—Liquidator, Mr. S. H. Hill, 1 St. Peter's Church Walk, Nottingham, appointed July 16th.

RADIO PHONOPORE & ELECTRICALS, LTD.—Mr. M. C. Spencer, 3, Frederick's Place, Old Jewry, E.C.3, appointed liquidator, with a committee of inspection, July 5th.

Private Arrangements.—M. M. WALKER, trading as the Walker-Bailey Electric Co., Kinning Park, Glasgow, electrical engineer.—A meeting of creditors was held recently at the offices of Messrs. Henderson, Jardine & Dunlop, C.A., Glasgow. Approximate figures were submitted which disclosed liabilities of £1,404. The assets were estimated to realise £252, leaving a deficiency of £1,152. It was reported that the business was commenced in October, 1924. A balance sheet was prepared at December, 1925, which showed a profit of £145. The debtor had an interest in the estate of the late Mr. David Walker, amounting to £1,960, but it appeared that he had had advanced to him moneys in excess of that sum. Debtor attributed his position largely to lack of capital. It was decided that the debtor should execute a trust deed in favour of Mr. Dunlop, and that a committee of three of the creditors should be appointed to act with him.

KIRBY (WIMBLEDON), LTD., 72, Merton Road, Wimbledon, S.W., radio and electrical engineers.—A meeting of creditors was held on July 23rd at Wimbledon, when the chair was occupied by the receiver for the debenture holders, Mr. W. T. Flower, C.A. A statement of affairs was presented, which showed liabilities of £1,255, all due to unsecured trade creditors. There were also debentures and interest accrued amounting to £1,007. The net assets were £636, leaving a deficiency, so far as the debenture holders were concerned, of £371. The deficiency, so far as the creditors were concerned, was £1,626. The chairman said that he had not included the lease and goodwill, as he did not consider they were of any value. The company was incorporated in 1925, with a nominal capital of 4,000 shares of £1 each, of which £2,000 represented the original amount as issued to the vendor and nominees; £1,500 was issued to directors in respect of services rendered; and £500 was subscribed in cash. Mr. Kirby originally carried on business as a greengrocer, but during the wireless boom he decided to turn his shop into a wireless store, which he called "The Reputation Radio Co." The business was carried on successfully until 1925, when Mr. Kirby decided to sell the assets to a company for £2,000. Mr. Driver, Mr. Thompson, and Mr. Kirby were appointed directors of the new company, and Mr. Kirby received £250 from each of the other directors. That left very little working capital after the stock had been paid for. It was later arranged that the three directors would put into the company £100 between them in order that they might carry on. When the Wembley Exhibition opened, the company obtained two stands there, and according to the directors good business was done, but the receiver had not been able to trace any record of the takings. The company first found itself in difficulties in November last, and a Mr. Tagg was introduced, and he paid a premium of £100 to learn the business. It was also arranged that he should pay a further sum of £2,000. Of that amount Mr. Kirby received £500; about £500 was expended on stock, and £1,000 was secured by debentures bearing interest at 7 per cent. The interest on those debentures had been paid for six months. On January 1st, 1926, Mr. Kirby opened a shop in Hammersmith called the "Dudley Radio Stores," and obtained credit from Kirby (Wimbledon), Ltd. That business, however, was only carried on for two months. The debenture holders and the directors, excluding Mr. Kirby, desired to carry on, and try and make good if possible. The shares of the company could be re-issued under a new name. The receiver was instructed to make the following offer, provided the company was not wound up, that the unsecured creditors should receive a dividend of 1s. in the £, in order to clear the position from the directors' point of view. The chairman pointed out that if the company was wound up, the creditors could not hope to receive any dividend. The creditors agreed to accept the offer. The following are creditors :—

	£		£
Cable and Electrical Supplies Co.	385	Graham, Alfred, & Co.	36
Iles, W. F.	56	Wimbledon Motor Works, Ltd. ...	35
Sully, J. & A. W., & Co. ...	51	British Thomson-Houston Co.,	
Kensington Wireless Supply ...	50	Ltd.	35
Jacques & Co.	50	Martinson, W., & Co.	30
Osborne Co., Ltd.	43	Manning, W. M.	23
Bagot & Thompson	35	General Electric Co., Ltd. ...	23
Corporation of Wimbledon ...	36		

Dissolutions of Partnership.—THE WORTHING PORTRAIT CO., photographers and radio dealers.—Messrs. P. J. Page and A. S. F. Nicholls have dissolved partnership. Mr. Page will attend to debts.

D.S.F. Co., radio and electrical dealers, Burnley.—Messrs. H. Sutcliffe, W. Dugdale, and J. Foxcroft have dissolved partnership. Messrs. Dugdale and Foxcroft will attend to debts and continue the business under the same style.

The partnership between Mr. JOHN FARQUHAR and Mr. JAMES HEYS, carrying on business as electrical contractors in Limbrick, Blackburn, as Farquhar & Heys, has been dissolved. Mr. Heys will continue the business.

The "Beama" Book.—This elaborately-produced volume is described as a history and survey of the organisation and work of the British Electrical and Allied Manufacturers' Association. As such it naturally touches upon many matters of more general interest connected with the industrial and economic life of this country. In the introduction the dictum of the pessimists that the existing industrial depression is of a permanent nature is refuted, for, it is claimed, electricity is destined to change all this and bring about efficiency and eventual prosperity. Turning to the organisation itself, the book says that since 1911 four main objects have formed the basis of development, *viz.*, the formation of a central organisation for the discussion and treatment of all questions affecting the electrical and allied industries; the provision of a medium of communication between manufacturers and Government, municipal, local, or public authorities, and the Legislature; the creation of an organ to promote trade in foreign and colonial markets; and the furnishing of an economic and technical in-

telligence service for the electrical and allied industries. These objects have been extended and elaborated, and the volume aims at showing the manner in which they have been carried out in the direction of research, standardisation, education, service, and special publications on electricity supply and important foreign electrical industries. The second part of the volume deals with the contribution of "Beama" to national prosperity; it is there claimed that the electrical industry, largely through the agency of the Association, has contributed, and is contributing in no small measure, to the favourable balance of trade. Figures are quoted in support of this which show that in 1913, when our exports of electrical goods were £9,397,000, the surplus over imports was £6,464,000; in 1925, when exports were valued at £17,351,000, the favourable balance was £11,995,000. The statement made by Col. Morcom at the annual meeting of the B.E.A.M.A. is repeated that the manufacture in this country of the electrical goods, valued at £5,000,000 imported during 1925, would have provided employment for a further 25,000 persons. This leads to a consideration of unemployment, wages, and prices. A high rate of employment has been maintained in the electrical industry during the prevailing depression due, to a great extent, to the enterprise and skill of Association firms. The action of municipalities and other public bodies in placing orders abroad is condemned as adding to unemployment, and reducing the ability of the industry to quote low prices, leading to further losses of orders and eventually higher taxation. During 1925 imports of manufactured goods rose by 18 per cent. above the 1924 level; the Association connects with this circumstance the fact that unemployment rose by 16 per cent. It is pointed out that low prices are not the be-all and end-all of industrial production; an industry earning insufficient profits cannot contribute with its full weight to national prosperity. The remainder of the volume is devoted to a review of the excellent progress made during the last few years in the British electrical industry, and this section is copiously illustrated with pictures of the products of member-firms of the Association, indicating a wide range of activity. Attention is given to the advance of electricity in the home, in the factory, and generally. The publication concludes with a complete list of members of the Association.

Book Notices.—"Yallourn and the Associated State Electricity Schemes of Victoria," prepared by S. E. Barrett. Melbourne: The Australasian Electrical Times. Price 5s.

Scientific Papers of the U.S.A. Bureau of Standards. No. 523, "Wind Pressures on Structures" (20 cents); No. 524, "Measurements on the Thermal Expansion of Fused Silica" (10 cents); No. 526, "Transmission and Absorption of Sound by some Building Materials."

"The Technical Report of the British Engine, Boiler and Electrical Insurance Co., Ltd., for the year 1925." Published by the Company, 24, Fennel Street, Manchester. Price 7s. 6d.

Post Office publications. Technical Pamphlets for Workmen.—Private Branch Exchange C.B. Multiple, No. 9. H.M. Stationery Office; price 6½d., post free.

"Electrocraft in Theory and Practice," by L. H. Baxter. Pp. 168; plates 61. London: B. T. Batsford, Ltd.; price 7s. 6d. net.

Journal of the American Institute of Electrical Engineers. Vol. XLV. No. 7. July, 1926. New York: The Institute; price $1.

"Engineering Abstracts from the Current Periodical Literature." No. 28. July, 1926. London: Institution of Civil Engineers.

Journal of the Franklin Institute. Vol. 202. No. 1. July, 1926. Philadelphia: The Institute; price 60 cents.

"The British Journal of Radiology." Vol. XXII. No. 88. July, 1926. London: Percy Lund, Humphreys & Co., Ltd.; price 5s. net.

Transactions of the Illuminating Engineering Society. Vol. XXI. No. 5. July, 1926. Easton, Pa.: The Society.

Transactions of the Institute of Marine Engineers (Inc.). Vol. XXXVIII. July, 1926. London: The Institute.

The Leipzig Autumn Fair.—We have received some particulars of this Fair, the technical and building section of which is to be held from August 29th to September 4th. Information can be obtained from the London office of the Fair, 1, Gower Street, W.C.1.

Reduction of Capital.—Mr. Justice Romer, in the Chancery Division, on July 27th, sanctioned a reduction of the capital of Messrs. Mawdsleys, Ltd., from £30,000 to £13,333 13s. 4d. Mr. Nesbit, for the company, said it had suffered losses due to depression in the electrical engineering industry and depreciation in the value of stock. The company's losses occurred in the years 1922-23-24, but in 1924-25 a profit was made, and the object of the petition was to cancel capital lost or unrepresented by available assets.

B.S.A. Petition.—In the Chancery Division, on Tuesday, Mr. Justice Romer sanctioned a petition by the Birmingham Small Arms Co., Ltd., for the extension of its objects. Mr. W. F. Spens, K.C., for the company, said since the war the company, which then was almost exclusively engaged on munition-making, now wished to extend its operations to electrical engineering and the manufacture of wireless apparatus, as well as motor and general engineering. It also desired to carry on these operations through subsidiary companies, and to finance and guarantee these companies.

Lighting and Power Notes.

Australia.—BRISBANE.—The *Electrical Engineer of Australia and New Zealand* reports that the Greater Brisbane Council and the City Electric Light Co., Ltd., have been negotiating with a view to arranging for the future electricity supply to the city. An agreement has been arrived at that, as a preliminary step, the Council should obtain a report by an independent expert as to the cost of installing plant to supply light and power for the whole of the city of Brisbane, provision being made for ten years' expansion. The Council has appointed Mr. W. H. Myers, chief electrical engineer of the New South Wales Railways and Tramways Department, to prepare the report and estimate. Accountants will also report on the value of the unexpired franchise and agreements of the company.

Barrow-in-Furness.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. R. Burnett) for the year ended March 31st last record a total revenue of £92,864, as compared with £89,113 in 1924-25. Working expenses decreased from £58,472 to £57,823, leaving a gross profit of £35,041 (£30,641). After meeting interest and sinking fund charges there was a net profit of £6,945, as compared with a surplus of £5,433 in the previous year. The capital expenditure during the year amounted to £32,604, the chief item being £16,500 for mains and services. The sales of electrical energy increased from 11,379,093 to 14,454,079 kWh, and the maximum supply demanded from 4,400 to 5,200 kW. The average price obtained per kWh fell from 1.849d. to 1.516d.

Bath.—YEAR'S WORKING.—The report of the city electrical engineer (Mr. J. W. Spark) on the working of the electricity undertaking for the year ended March 31st last shows a total income of £65,247, as compared with £55,430. Working expenses amounted to £34,283, as against £31,165, resulting in a gross surplus of £30,964 (£24,265). After payment of capital charges there was a net profit of £2,262, as compared with £6,319 in 1924-25. A contribution of £1,000 was made to the borough fund. The capital expenditure during the year amounted to £74,241, the chief items being £17,504 for buildings, £12,909 for machinery and plant, and £24,563 for mains and services. The consumption of electrical energy increased from 4,390,951 to 5,640,490 kWh, and the maximum supply demanded from 3,380 to 3,910 kW.

Beckenham.—LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £3,000 for additional plant.

Bexhill.—LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £5,750 for the provision of converting plant.

Blackpool.—EXTENSION OF SUPPLY.—The Town Council on July 21st decided to make application for authority to supply electricity within the urban district of Poulton and the parishes of Carleton and Marton. It was stated that the outside districts would pay for a period of ten years 20 per cent. in advance of the Blackpool tariff, and for a further period of ten years 10 per cent. would be paid. In the event of any of the districts becoming amalgamated with Blackpool, they would pay only 10 per cent. for ten years. The cost to the Blackpool Corporation was about £47,000, made up of feeders, distributing mains and services, which it is anticipated would number 600 in the next five years.

Bolton.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. W. J. H. Wood) on the working of the electricity undertaking for the year ended March 31st records a total income of £316,364, and working expenditure of £171,139, leaving a gross profit of £145,225. The figures for the previous year were: Income, £293,125; working expenses, £149,675; gross profit, £143,450. After payment of capital and other charges there was a net profit of £26,487, as compared with £23,915 in 1924-25, which was carried to appropriation account, together with a balance from the previous year of £27,180, making a total of £53,668. Contributions to capital expenditure absorbed £20,262, and £4,500 was transferred to the borough fund, leaving a balance carried forward of £28,905. The capital expenditure during the year amounted to £73,099, and included £37,435 for mains. The sales of electrical energy rose from 47,970,033 to 50,066,009 kWh, and the average price obtained per kWh rose from 1.26d. to 1.27d.

Bradford.—STREET LIGHTING.—The Finance Estimates Sub-Committee and the Special Lighting Sub-Committee have approved a recommendation by the Electricity Committee in favour of the conversion of the lighting of all main roads served by the tramway and railless-car systems from gas to electricity. The Gas and Electricity Departments are to confer with regard to the lighting of other roads where both illuminants are at present in use. They are instructed to submit a scheme if they reach agreement or, failing agreement, to submit separate reports.

ELECTRICITY EXTENSIONS.—The City Electricity Committee has considered a scheme submitted by the electrical engineer (Mr. T. Roles) for proposed extensions at the Valley Road power station. A special sub-committee has recommended that arrangements be made for carrying out the extensions, and that application be made for sanction to the scheme and for power to borrow the necessary capital. The matter has been adjourned to the next Council meeting. The Electricity Committee has applied for sanction to further expenditure of £20,000 on mains extensions, &c.

Cheltenham.—ELECTRICITY SUPPLY.—The Electricity Committee is to ascertain from the Shropshire, Worcestershire, and Staffordshire Electric Power Co. terms for a supplementary supply for Cheltenham.

Chester.—YEAR'S WORKING.—The report on the working of the city electricity undertaking (engineer: Mr. S. E. Britton) for the year ended March 31st last shows that after meeting all charges there was a net balance carried forward of £7,265. The year has produced records in the number of new consumers connected to the supply and in the increase in the electrical energy sold, namely, 619 consumers (295 in Chester and 324 in the outlying area) and 836,922 kWh. The supply of electricity in the outlying area of supply has gone ahead satisfactorily and exceeded the expectations upon which the scheme was formulated. At March, 1925, the undertaking was supplying 758 consumers outside the city boundaries, and during the year the consumption advanced from 355,234 to 601,416 kWh.

Continental.—FRANCE.—The Société des Mines et Fonderies du Zinc de la Vieille-Montagne has been authorised to establish a 38,000-V transmission line between Pampelona (Department of Tarn) and its zinc works at Viviez (Aveyron). A 38,000-15,000-V transformer station is to be established at Vaurelles in connection with the scheme.

SWITZERLAND.—The Bundner Kraftwerke Gesellschaft, in view of a new contract for the supply of power for the Swiss Federal Railways, has decided on the construction of a new power station at Kublis, the erection of a 64-kV single-phase transmission line between Kublis and Sargans, and also a 150-kV line between Landquart and Siebnen. The old power station at Klosters-Dorfli is also to be modernised.

Douglas (I. of M.).—NEW PLANT.—In connection with the Town Council's proposal to extend its plant, at a cost of £76,000, the report submitted to the Council by Messrs. Handcock & Dykes states that the maximum load for the current year will be 820 kW, which is the whole capacity of the existing plant, allowing for one of the present sets being in reserve. Assuming the growth for the next five years is at the same rate as at present, by 1930 a maximum load of 1,460 kW would be reached. To provide for some years to come, about 1,000 kW of additional plant is necessary, 500 kW to be a.c. and 500 kW d.c. Application is to be made to Tynwald for sanction for the following expenditure:—Oil-driven 1,000-kW set, complete, £26,377; mains and sub-stations, £12,000; switchgear and gallery, £1,500; crane extension, £100; motor generator, £3,000; building extension, clearing site, &c., £4,750; provision for mains and services during the ensuing year, £8,000; balancer booster on order (extended to meet new scheme), £1,000; amount expended to meet new services since last loan authority, £19,000.

East Ham.—YEAR'S WORKING.—The report of the engineer and manager of the Corporation's electricity undertaking (Mr. W. R. Elliott) for the year ended March 31st last shows a total revenue of £96,685, as compared with £87,574 in the preceding year. Working expenses amounted to £64,028, as against £61,969, leaving a gross profit of £32,657 (£25,605), to which was added a balance of £815 brought forward from the previous year and bank interest of £213, making a total of £33,685. Capital charges and revenue contributions to capital expenditure absorbed £27,571, and there was a net profit of £6,114. The consumption of electrical energy increased from 7,447,900 to 8,385,680 kWh, and the maximum supply demanded from 3,444 to 3,930 kW. The average price per kWh obtained fell from 3.116d. to 3.05d.

Goring and Streatley (Berks.).—FIRE.—The daily Press reports that the power station was destroyed by fire on July 24th.

Horsham.—YEAR'S WORKING.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. F. Ffrench) for the year ended March 31st, 1925, show a total income of £12,716, and working expenditure of £6,678, leaving a gross profit of £6,038. After deducting capital and other charges there was a net profit of £1,622, of which £500 was transferred to reserve, and the remainder contributed to the district fund. The electrical energy sold increased from 575,574 to 655,345 kWh, and the average price obtained per kWh decreased from 5.10d. to 4.35d.

Irish Free State.—LIMERICK.—The city electricity supply is to be augmented from the temporary power station of Messrs. Siemens-Schuckert, Ardnacrusha. The contractors, at the meeting of the Harbour Board last week, applied for permission to erect steel standards to carry the cables across Sarsfield Bridge, and along the line of the quays. The application was referred to a committee to investigate and report.

London.—BATTERSEA.—The Electricity Committee has received sanction to the borrowing of £20,000 for mains and services.

STOKE NEWINGTON.—The Electricity Committee has received sanction to loans of £10,000 for mains and services, and £3,000 for meters.

POPLAR.—The Electricity Committee has recommended to the Borough Council that in view of the high cost of coal, the charges for electricity be increased from 40 per cent. to 50 per cent. above the pre-war rate.

ST. PANCRAS.—The Electricity Committee has recommended to the Borough Council that, in view of the increased cost of coal, the charges for electricity be increased by 10 per cent., from the meter readings for the September quarter.

Millom.—ELECTRICITY SUPPLY.—In connection with the scheme for a supply of electricity in the district, sanction to which has been received, the Council will take a supply from the Millom Iron Works and reduce it to 3-phase, 400-V and 210 V for distribution.

Portsmouth.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. B. Handley) for the year ended March 31st last shows a total revenue of £174,692, as compared with £151,572 in the preceding year. Working expenses were £107,267, as against £99,224, leaving a gross surplus of £67,426 (£52,348). After meeting capital charges there was a net profit of £19,783, as compared with £14,575 in 1924-25, which was distributed as follows: Contribution to borough fund, £5,000; transferred to reserve, £14,783. The capital expenditure during the year, which included £41,769 for machinery, and £85,630 for mains and services, amounted to £153,165. The sales of electrical energy amounted to 13,770,961 kWh, and the maximum supply demanded reached 8,600 kW.

Preston.—STREET LIGHTING.—The work of converting to electricity gas lamps in side streets is proceeding. In Preston there are 2,750 public lamps, and the Corporation's plans provide for the conversion of 500 ordinary street lamps to electricity by the end of March next, to be increased eventually to 1,000 in all. When this is done, about a half of the town's street lighting will be by electricity.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

DOUGLAS (I. OF M.):—Heating and power: From 3d. to 2½d. per kWh; flat rate from 2d. to 1½d. per kWh. Two part tariff, from 1½d. to 1¼d. per kWh.

WEST YORKSHIRE:—Lighting: Flat rate from 6½d. to 6d. per kWh. Power to small consumers: For a minimum of £1 per annum per h.p. installed, 3½d. per kWh; £3 per year per h.p. installed, first 3,000 kWh per quarter, 2d. per kWh, all energy in excess 1½d. per kWh. Residential tariff: 12s. per room, plus 1½d. per kWh for the first 25 kWh per room per quarter, and 1d. per kWh for all additional energy.

EDINBURGH:—Power: First 1,000 kWh per annum, from 1.5d. to 1.4d. per kWh; next 30,000 kWh, from .85d. to .8d.; over 30,000 kWh, from .75d. to .7d. Reductions for domestic heating are also recommended.

BEXHILL.—Lighting: From 6d. to 5½d. per kWh. Power: from 2d. to 1½d. per kWh.

Special Orders.—Application has been made to the Electricity Commissioners by the Newcastle-upon-Tyne Electric Supply Co., Ltd., to amend the draft of the Coquetdale Electricity Special Order so as to include the parish of Denwick, in addition to the districts already mentioned in the Order.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Midland Electric Corporation for Power Distribution, Ltd., to supply electricity in part of the rural district of Seisdon, and Messrs. Callender's Cable & Construction Co., Ltd., to supply in part of the parish of Chessington.

Swansea.—EXTENSION OF SUPPLY.—The borough electrical engineer has reported to the Electricity Committee that Mr. T. H. Henderson has applied for a supply of electricity in bulk to the Cwmllynfell and New Brook Collieries, in the Amman Valley. He also states that the Brynamman and Raven Collieries have been connected up and that the estimated cost of giving a supply to these collieries would be £15,600. The Committee has resolved that the application be granted, and has instructed the Town Clerk to make application for sanction to the borrowing of the £15,000 for the purpose.

Swinton and Pendlebury.—ELECTRICITY CHARGES.—The Urban District Council has offered to supply consumers of electricity for domestic use at an alternative fixed annual charge of 20 per cent. of the rateable value, plus ¾d. per kWh for all electricity consumed.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—The *Electrical World* states that the Bellows Falls (Vt.) hydro-electric development of the New England Power Company will include three sets of about 14,000 kW each. Development will include two h.p. switching stations, one on either side of the open tailrace. One station will tie in with the 66,000-V line to Vernon and the lines north, while the second will be of a higher voltage and will handle the main outgoing load to the east. The estimated gross output of the Bellows Falls plant is about 150,000,000 kWh per year. A smaller development on the Deerfield River, to be known as the Sherman power station, will contain a single set of about 7,500 kW and is designed for automatic operation. Power from this plant will be stepped up to 110,000 V. It is estimated that the average annual output of the plant will be 25,000,000 kWh.

Walsall.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. A. Howie) for 1925-26 record an income of £104,122, as compared with £102,592 in the preceding year. Working expenses amounted to £59,431, as against £56,396, leaving a gross profit of £44,691 (£46,196). After providing for capital charges there was a net surplus of £13,065, as compared with £14,830 in 1924-25. The capital expenditure during the year, which included £35,074 for mains and services, amounted to £45,808. The electrical energy sold increased from 13,953,947 to 16,015,163 kWh, and the maximum supply demanded from 5,700 to 6,500 kW. The average price obtained per kWh fell from 1.72d. to 1.56d.

West Ham.—INQUIRY.—Colonel T. C. Ekin will hold an inquiry on August 5th into the application of the Town Council for sanction to a loan of £130,826 for the extension of the generating station by the installation of a 10,000-kW set and auxiliary plant.

Tramway and Railway Notes.

Australia.—ADELAIDE.—According to the *Electrical Engineer of Australia and New Zealand*, the South Australian Government has decided upon the electrification of the railway lines from Adelaide to Glenelg at present running from North Terrace and South Terrace stations. It is proposed to divert the South Terrace line at Goodwood and bring it in to North Terrace station. It is stated that the system will be similar to that used in the Melbourne suburban electrification, *viz.*, 1,500 V d.c., with multiple-unit trains. The gauge is the same as that in Melbourne, 5 ft. 3 in. Power will be purchased from the Adelaide Municipal Tramways Trust. It is expected that the electrification will be complete in 18 months. Probably a further step will be taken later in the electrification of the Adelaide-Port Adelaide line.

Brazil.—RAILWAY ELECTRIFICATION.—The Ministry of Transportation has announced that the electrification of the Central Railway of Brazil will be started before the end of the year. The first section to be electrified will be the suburban district of Rio de Janeiro for a distance of about 40 miles. The project will be financed by the National Government.—*Reuter's Trade Service* (Rio de Janeiro).

Continental.—NORWAY.—The *Financial Times* reports that the strike of municipal workers and tramway officials, which has been in progress for the last six weeks, came to an end on July 21st, the men having agreed to a reduction in wages of about 15 per cent.

HUNGARY.—Owing to the relative scarcity of hydro-electrical energy in the country, the power for the electrified railways of the Hungary State system is to be supplied from power stations which are to be established in the vicinity of the lignite mines at Varpalota and Matras. The first will supply energy for the Budapest-Kiralyhida line and the second, which it is reported is being constructed by a Hungarian-American syndicate, will supply the Budapest-Hatvan-Miskolcz line.

London.—OIL FUEL.—The " Underground " Company states that oil-burning equipment has been obtained for a number of the largest boilers in the Lots Road power house. This equipment can be put into operation at short notice if the coal supply is inadequate for the train services supplied from this source.

TRAMCAR SUBWAYS.—The Highways Committee of the L.C.C. has considered a proposal to deepen the present subway from Southampton Row to Victoria Embankment so as to make it available for double-deck cars, but has decided to take no further action at present. It has also been decided not to promote a Bill in the next session for the construction of new tramway routes.

Oldham.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager: Mr. C. Jackson) for the year ended March 25th last records a total revenue of £230,652, and working expenditure of £191,828, leaving a gross profit of £38,824. The previous year's figures were:—Income, £215,615; expenditure, £178,852; gross profit, £36,763. Revenue from other sources amounted to £5,441, making a total of £44,265 available. After providing for interest, sinking fund charges, &c., a net surplus of £6,118 remained, as against £3,695 in 1924-25, which was carried to appropriation account, together with a surplus of £304 from the railless-car system, making a total of £6,421. Against this, a loss on the motor-omnibus service of £1,470 was charged, leaving a balance of £4,951, which was transferred to reserve. The number of passengers carried increased from 36,364,299 to 38,532,238, and the car miles run from 2,654,196 to 2,725,331. The revenue per car-mile rose from 19.33d. to 19.966d.

Southport.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager: Mr. T. J. Kendrew) for the year ended March 31st last shows a total revenue of £71,330, as compared with £76,627 in the preceding year. Working expenses increased slightly from £52,366 to £54,864, resulting in a gross surplus of £16,467 (£24,261). After payment of capital charges and contributing £3,400 to renewals fund, there was a net surplus of £72, which was carried to appropriation account, together with a balance from the previous year of £4,402, making a total of £4,474. This was disposed of as follows:—Rate relief, £2,820; carried forward, £1,654. The number of passengers carried increased from 11,182,524 to 12,579,004, and the car-miles run decreased from 1,015,969 to 987,128. The receipts per car-mile fell from 18.101d. to 17.342d.

Telegraph and Telephone Notes.

Bolivia.—TELEGRAPH CONTRACT.—Telegraphic advice was last week received in London from La Paz to the effect that a contract has been signed betwen the Government of Bolivia and Marconi's Wireless Telegraph Co., Ltd., whereby the latter will, as from October 1st, 1926, control and operate the postal telegraph and wireless services of Bolivia for a period of 25 years on the basis of a percentage of the gross receipts of the services as remuneration for management, plus a proportion of the profits when there may be a surplus. It will be recalled that in 1921 the Marconi Co. took over the control of the telegraph and wireless services of Peru, which services were then showing an annual deficit, but within a very short time the Budget was balanced and for several years a substantial surplus has been realised.

Czecho-Slovakia.—AUTOMATIC TELEPHONY.—The State Telephone Department has decided to convert the manually-operated system in the large Moravian industrial town of Mayrish-Ostrau to automatic working. For the conversion the " Relay " system has been selected and, according to the scheme already prepared, there will be a central exchange of 2,500 lines initially, which will later be extended to 7,000 lines and will be capable of further extension to 10,000 lines. In addition to the main exchange at Mayrish-Ostrau, six local exchanges will be erected, one for 200 lines in Witkowitz and others in Marienberg, Radvanitz, Hohenstadt, Kruschen, and Schonbrunn.

Denmark.—TELEGRAPH SERVICE.—According to a recently-issued official report, the telegraph system in Denmark comprised 8,328 miles of overhead lines, 228 miles of underground lines, and 610 miles of submarine lines at the end of March, 1925. During the fiscal year 1924-25, 1,282,000 internal messages, 2,345,000 international, and 1,106,000 " transit " messages were handled, as compared with averages of 1,491,000, 2,486,000, and 920,000, respectively, in the three preceding years.

Italy.—COMMUNICATION SERVICES.—In a Department of Overseas Trade report on Italy in 1925, reference is made to the transfer of the telephone service to private companies and the inauguration of an all-Italian submarine telegraph cable to South America. The operation of the telegraph, wireless, and telephone services in 1924-25 resulted in a net profit of lire 20,584,552.

More " Taxiphones."—LIVERPOOL SUCCESS.—" One-way " telephones to cab ranks in Liverpool have proved such a convenience to the public that they are now to be installed in Birkenhead, on the opposite side of the Mersey. A call on these telephones cannot be made in the first instance from a cab rank, but when a " fare " rings up the rank for a cab an iron door enclosing the receiver flies open, thus attracting the attention of the taxi-driver, who at once accepts the order. All telephone subscribers are to be provided with a printed list, with call numbers, of these ranks.

Telephones at Sea.—A SHIP'S INSTALLATION.—In a new 22,000-ton liner which is being built in an American yard there will be 325 telephones. They are not being installed for the convenience of the passengers alone, but are intended also to contribute to the efficient work of the entire crew of the *Malolo* (Hawaiian for flying fish). Two loud-speaking telephone systems are to be included, one for communication between the bridge, after docking bridge, crow's nest, and the main engine-room, while the other will connect the chief engineer's room and the main engine-room.

Radio Notes.

Alternative Programmes.—B.B.C. TEST RESULTS.—The transmission of alternative programmes simultaneously from two London stations with the same power, but on different wavelengths, resulted in the British Broadcasting Co. receiving 10,000 letters from listeners, which indicated that about one-third of the crystal-set users and 4 per cent. of the valve receivers failed to separate the two programmes at a distance of five miles from the transmitting stations.

China.—PROPOSED BROADCASTING COMPANY.—A merchant, Liu Chih-hsin, has applied to the Canton Municipal Bureau for the privilege of erecting a station in Canton for broadcasting within 100 miles of Canton. The applicant suggests the organisation of Kwang Li Co., Ltd., with a capital of $100,000, and asks for a monopoly for 10 years during which the company shall enjoy the exclusive privilege of installing receiving sets at first-class restaurants, hotels and public resorts at a cost of $100 a year, middle-class restaurants, hotels, clubs, and public organisations at $60 a year, and business houses, residences, newspaper offices, hospitals and schools at $30 a year. The applicant proposes to pay 30 per cent. of the net receipts to the Provincial Government in return for the monopoly. Accordng to the *Chinese Economic Bulletin*, the Municipal Bureau has referred the matter to the Bureau of Public Works and the Bureau of Public Safety for consideration.

Latin America.—NEW STATIONS.—Among some recently-completed Latin-American installations are a broadcasting station at Port-au-Prince, Haiti, and a receiving station at the city of Paraguarí, in the Republic of Paraguay, where musical programmes broadcast from stations in Buenos Aires and North America have been heard very clearly. At Vera Cruz (State of Vera Cruz), the principal port of entry into Mexico, a broadcasting station with a wavelength of 337 metres and an output of 50 watts (call letters CYC) has been recently installed.—*Reuter's Trade Service* (Port-au-Prince).

Loud-speakers.—READING BAN.—The Reading Town Council has obtained Government sanction for a by-law which makes it a punishable offence for anyone to operate a wireless loud-speaker " in any street or public place or any place adjoining a street or public place, in such manner as to cause annoyance to residents or passengers." In Reading chief complaint comes.

it is understood, from people living near wireless apparatus shops wherein loud-speakers are used to attract notice, but the new by-law will, it is believed, be effective in checking the use of loud-speakers in the open by private residents. There is provision for penalties up to £5. In London proceedings have been taken against shopkeepers using loud-speakers for causing a crowd to collect and obstructing the pavement. The *Evening News* records that the Sidcup Council has decided to inquire into the loud-speaker "nuisance," on the motion of Councillor R. Ellison, who suggests the formation of a Society to Check Noises.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—August 23rd. Electricity Commission of Victoria.—10-in. disk suspension insulators. (July 2nd.)

September 1st. Victorian Government Railways. Automatic sub-station equipment for Elwood sub-station. (B.X. 2598.)*

August 3rd. Postmaster-General's Department. Telephones and dials.*

August 11th. City Council. H. and l.p. 3-phase sub-station switchgear.*

August 10th. Telephone exchange indicators. (B.X. 2597.)*

August 31st. Telegraph equipment. (B.X. 2633.)*

September 14th. Telephonists' telephones and hand sets.

September 21st. Switchboard keys and parts. (B.X. 2669.)*

October 12th. Automatic exchange equipment.

SYDNEY.—September 20th. Municipal Council. H.p. d.c. apparatus for cable testing.

September 6th. New South Wales Public Works Department. Oil circuit breakers, Barren Jack hydro-electric development.

BRISBANE.—August 26th. City Electric Light Co., Ltd. One 12,500-kW turbo-alternator.*

Barnes.—August 23rd. Urban District Council. One 3,000-kW turbo-alternator, with condensing plant and auxiliaries. (See this issue.)

Belfast.—July 31st. Electricity Department. One 15,625-kW turbo-alternator with condensing plant and auxiliaries, or, alternatively, one 18,750-kW turbo-alternator with condensing plant and auxiliaries. (July 2nd.)

Bridlington.—August 6th. Electricity Works. One 600-kW surface condenser with extraction plant and circulating pump, pipework, and valves. One wooden cooling tower, with tank and foundations. (July 16th.)

Coventry.—September 3rd. Electricity Department. Buildings, foundations, and subways, two 15,000-kW turbo-alternators, condensing plant, and auxiliaries. water-tube boilers, complete with accessories, coal- and ash-handling plant, switchgear, pipework, crane, and cooling towers. (July 23rd.)

Croydon.—September 6th. Electricity Department. Two 50,000-lb. water-tube boilers and equipment. (See this issue.)

Denmark.—AARHUS.—August 17th. Lighting Department. Steam turbo-generator and boiler plant. (A.X. 3371.)*

Dundee.—August 20th. Electricity Department. Supply, delivery, and erection of six 200-kVA outdoor-type transformers. (See this issue.)

Egypt.—CAIRO.—October 15th. Ministry of the Interior. Installation of electric power station equipment at Keneh and Luxor. (B.X. 2627.)*

August 2nd. Director-General, Mechanical Department, P.W.M., Cairo. 400-b.h.p. Diesel engine, driving an air compressor, together with auxiliary machinery.

September 15th. Electrical distribution system for Luxor. (B. 2737.)*

Halifax.—August 7th. Electricity Committee. Steel sheet piling at electricity works. Plans, form of tender, &c., from the borough engineer.

India.—August 9th. India Store Department. Electrical generating plant for the Peshawar power station of the North-Western Railway. (B.X. 2644.)*

September 10th. Switchgear and auxiliary plant in connection with the G.I.P. Railway electrification. Forms of tender (20s.) from the above.

Kilkeel.—August 5th. Rural District Council. Cold-starting crude oil engine, generator, booster and switchboard, storage battery, pole erection work, line erection work, erection of power house. (July 9th.)

Kilmallie (Fort William).—August 5th. Parish Council. Electric lighting work of new hostel. Plans with G. MacRitchie, architect, Fort William.

Liverpool.—August 31st. Corporation. Supply and installation of a closed-circuit, code-signalling street fire alarm and telephone system. (See this issue.)

London.—August 23rd County of London Electric Supply Co., Ltd. Supply and erection of a central evaporating equipment. (July 23rd.)

Manchester.—August 4th. Electricity Committee. 12 months' supply of electric cooking ranges. (July 16th.)

Quick-break switches and cut-outs required during period of 12 months. Specification (No. 169) and form of tender from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

August 21st. Waterworks Committee. Supply and erection of two electrically-driven centrifugal pumps, with switch and starting gears, &c. (See this issue.)

Montrose.—August 3rd. Electric lighting of St. John's U.F. Church. Specifications with Mr. D. M. McIntyre, Gas Works; tenders to Mr. J. G. Falconer, Blairgowrie.

Newark.—August 12th. Waterworks Department. One 200-kVA oil-cooled static transformer and 11,000-V switchgear cubicle. (July 23rd.)

New Zealand.—CHRISTCHURCH.—October 19th. Christchurch Drainage Board. Three sets of electric centrifugal pumping plant. (A.X. 3215.)*

WELLINGTON.—August 24th. Public Works Department. Synchronous condensers for the Waikaremoana electric power scheme. (B.X. 2608.)*

August 30th. 400-V, 3-phase, slip-ring induction motors and starters.*

September 28th. Three electrically-driven low-lift pumps, with control apparatus, for the Taleri drainage. (A.X. 3274.)*

November 2nd. Electric generators and turbines for Waikaremoana electric power scheme. (B.X. 2622.)*

Indoor control gear and switchgear in connection with the Waikaremoana electric power scheme. (B.X. 2675.)*

September 7th. Synchronous condenser for the Arapuni electric power scheme. (B.X. 2654.)*

August 10th. Postmaster-General's Department. Dry cells. (B.X. 2649.)*

DUNEDIN.—September 8th. City Council. One reaction waterwheel, with governor and valves, &c., one 3,000-kW generator, four 1,000-kW transformers, switchboards, oil-break switches, voltmeters, &c. (B.X. 2676.)*

Rumania.—CONSTANTZA.—September 15th. Port Administration. Supply and erection of 8 electric portable cranes. (A.X. 3399.)*

Sevenoaks.—September 1st. Urban District Council. Supply and installation of an electrically-driven siren at the fire station. (See this issue.)

Skelmanthorpe.—August 7th. Electric lighting installation at Liberal Club. Tenders to Mr. G. H. Ellis, Strike Lane.

South Africa.—August 12th. South African Railways and Harbours. Electric cables and wires and bare copper wire (for 12 months). (B.X. 2639.)*

Installation of electro-pneumatic power working of points and day colour-light signalling, with a.c. track circuits. (July 23rd.)

August 26th. Material for the distribution system, Capetown suburban electrification. (B.X. 2680.)*

JOHANNESBURG.—Town Council. August 19th. H.p. switchgear. (B.X. 2726.)

August 21st. Reverse power relays. (B.X. 2725.)*

Street-lighting material. (B.X. 2728.)*

PRETORIA.—August 26th. Municipal Council. Equipment for five transformer sub-stations.*

Stoke-on-Trent.—September 7th. Electricity Department. One 10,000-kW turbo-alternator and condensing plant. One natural-draught cooling tower. Ironclad l.p., 3-phase switchgear. (July 23rd.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Ayr.—Education Authority. Accepted:—

Electrical work in connection with the extensions to Lethanhill Public School (£120).—Reid & Co.

Beckenham.—Electricity Committee. Accepted:—

Switchgear (£122).—Park Royal Engineering Co., Ltd.
Cable (£1,365).—Hackbridge Cable Co., Ltd.

Bexhill.—Electricity Committee.

1,000 yards of .0225 twin cable.

Enfield Cable Works, Ltd. (Recommended.)	**£165**
British Insulated Cables, Ltd.	168

Birkenhead.—Gas Committee. Accepted:—

Electric telpher machine with patent wheels (£1,239).—Robert Dempster and Sons, Ltd.

Birmingham.—Board of Guardians. Accepted:—

Installation of electric light at the Monyhull Colony, King's Heath: Main cable system, switchgear, &c. (Section A).—Callender's Cable and Construction Co., Ltd. (£3,774). Installation work (Section B).—Walker Bros. (£1,490). (Section C).—Brightside Foundry & Engineering Co., Ltd. (£1,486). (Section D).—Thomas Glover (Birmingham) (£1,484).

Bradford.—Libraries Committee. Accepted:—

Electric lighting alterations at Manningham branch library (£63).—Collinson Bros.

Installation of electric lighting at schools: Gregory, £171; Barker End, £295; Hanson, £440.—J. S. Panen.

Brighton.—Electricity Committee. Accepted:—

4,080 yd. of cable (£1,487).—W. T. Glover & Co., Ltd.
Two "C" type portable conveyors, complete with Crossley petrol engines (£192 each).—C. H. Johnson & Sons.
D.c. switch panel for 1,000-kW motor converter set (£487).—Metropolitan-Vickers Electrical Co., Ltd.

Tramways Committee. Accepted:—

Ten traction motors (£180 per motor).—English Electric Co., Ltd.

Dundee.—Corporation Gas Committee. Accepted:—
Electrical work at the gas treasurer's office (£199).—Buglass & Jamieson, Ltd.

Government Contracts—The following contracts were placed by Government Departments during June:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Electrical boxes.—Engineering and Lighting Equipment Co., Ltd.; L. Weekes (Luton), Ltd.; Hawkers, Ltd.
Cables, boxes, &c.—Standard Telephones & Cables, Ltd.
Electric cables.—Johnson & Phillips, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; General Electric Co., Ltd.; Anchor Cable Co., Ltd.; W. T. Glover & Co., Ltd.; Macintosh Cable Co., Ltd.
Electric travelling crane.—Isles, Ltd.
Fans and spares.—James Keith & Blackman, Ltd.
Motor-driven fans.—Turbon Fan Co., Ltd.
Lampholders.—Cable Accessories Co., Ltd.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Sperryn & Co.
Motors.—Laurence, Scott & Co., Ltd.

WAR OFFICE.

Replating secondary battery.—Premier Accumulator Co. (1921), Ltd.
Electric cable.—Standard Telephones & Cables, Ltd.
Cranes (supply and erection).—Herbert Morris, Ltd.

AIR MINISTRY.

Magneto containers.—Boulton & Paul, Ltd.
Ignition spares.—Delco-Remy & Hyatt, Ltd
Generators.—British Thomson-Houston Co., Ltd.
Motor-generators and spares.—W. Mackie & Co., Ltd.
Magnetos and spares.—North & Son, Ltd.; Simms Motor Units, Ltd.
Sparking plugs.—Robinhood Engineering Works, Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Ericsson Telephones, Ltd.; International Electric Co., Ltd.; Peel-Conner Telephone Works; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.
Testing protective, and miscellaneous apparatus.—Chamberlain & Hookham, Ltd.; International Electric Co., Ltd.; Power Equipment Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.
Battery stores.—Alton Battery Co., Ltd.; D.P. Battery Co., Ltd.; Tudor Accumulator Co., Ltd.
Battery boxes.—W. & T. Lock.
Coin-collecting boxes.—Hall Telephone Accessories, Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Standard Telephones & Cables, Ltd.
Joint-box castings.—Ladywood Iron Works, Ltd.
Leclanché cells.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Earth clips.—Farmer, Stedall & Co.
Earpieces.—Peel-Conner Telephone Works.
Ebonite handles.—Siemens Bros. & Co., Ltd.
Insulators.—J. Bourne & Son, Ltd.; Bullers, Ltd.; Thos. de la Rue and Co., Ltd.; Doulton & Co., Ltd.; Taylor, Tunnicliff & Co., Ltd.
Telegraphic ironwork.—Bert Birks & Co.; Bullers, Ltd.; Chas. Richards and Sons, Ltd.
Wireless masts.—Horseley Bridge & Engineering Co., Ltd.
Recoating with ebonite.—Paragon Rubber Manufacturing Co., Ltd.
Lead sleeves.—G. Farmiloe & Sons, Ltd.
Bronze wire.—Johnson & Phillips, Ltd.
Copper wire.—Enfield Cable Works, Ltd.
Switchboard wire.—General Electric Co., Ltd.
G.I. stranded wire.—Whitecross Co., Ltd.; Dorman, Long & Co., Ltd.; Rylands Bros., Ltd.
Replacing batteries.—Birmingham H.P.O.: Premier Accumulator Co. (1921), Ltd.
Telephone exchange equipment.—Govan (Glasgow): Siemens Bros. and Co., Ltd.; sub-contractors: Hart Accumulator Co., Ltd., for batteries; English Electric Co., Ltd., for charging machines; and Crompton & Co., Ltd., for ringing machines. Fitzroy (Museum Relief): Automatic Telephone Mfg. Co., Ltd. Whitley Bay: Ericsson Telephones, Ltd. Birmingham (North), Clyde Valley Electrical Power Co. and Albright & Wilson, Ltd. (Oldbury): Standard Telephones and Cables, Ltd. West Riding County Council (Wakefield): Anchor Cable Co., Ltd. D. Gestetner, Ltd. (N.): Relay Automatic Telephone Co., Ltd.
Telephone repeater stations.—Two-wire repeater equipment.—Jedburgh and Edinburgh: Standard Telephones & Cables, Ltd. Four-wire repeater equipment extension.—Aldeburgh: Standard Telephones & Cables, Ltd.
Direction-finding apparatus.—Port Patrick (Wigtownshire): Marconi's Wireless Telegraph Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Cables, &c.—E. Baylie & Co., Ltd.; W. T. Glover & Co., Ltd.; London Electric Wire Co. & Smiths, Ltd.; Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Cranes.—Sir Wm. Arrol & Co., Ltd.; Thos. Smith & Sons (Radley), Ltd.
Lux cells.—Chloride Electrical Storage Co., Ltd
Mechanical stokers.—Underfeed Stoker Co., Ltd.
Plant.—Belliss & Morcom, Ltd.
Spares for turbines.—Brush Electrical Engineering Co., Ltd.
Spares for signalling apparatus.—Tyer & Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Telegraph line materials.—Siemens Bros. & Co., Ltd.
Telephone materials.—Ericsson Telephones, Ltd.
Train-lighting equipment.—J. Stone & Co., Ltd.
Copper wire.—F. Smith & Co., Ltd.; Shropshire Iron Co., Ltd.; Elliott's Metal Co., Ltd.
Bronze wire.—F. Smith & Co., Ltd.

OFFICE OF WORKS.

Fuseboards, &c.—Cable Accessories Co., Ltd.

Hemsworth.—Rural District Council. Accepted—
Wiring 50 houses on the Great Houghton estate for electric light (£1 5s. per point).—Houghton Main Colliery Co., Ltd.

Irish Free State.—Board of Works. Accepted:—
Installation of heating and electrical plant, &c., at the butter testing station, Dublin.—Haden's Engineering Co., Ltd.
Electrical works and supplies for Dublin district.—Gleeson, O'Dea & Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£1,818); Macintosh Cable Co., Ltd. (£3,039).

Lichfield.—City Council. Accepted:—
Three-phase electricity meters for a year.—Measurement, Ltd.
60 lamp standards (£3 18s. 6d. each); 24 wall brackets (£1 12s. 6d. each).—Cable Accessories Co., Ltd.

London.—SHOREDITCH.—Electricity Committee. Accepted:
Hotwell feed tank £393).—Hick, Hargreaves & Co., Ltd. Single-core, paper-insulated and plain lead-covered cable (£3,372); three-core, paper-insulated, lead-covered, double steel tape armoured, &c., cable (£1,289); 2-core rubber-insulated, lead-covered cable (£64).—W. T. Glover and Co., Ltd.

STEPNEY.—Electricity Committee.
Alterations and additions to boiler plant at Limehouse generating station (£18,554).—Babcock & Wilcox, Ltd.

SOUTHWARK.—Metropolitan Water Board.
Electric lighting at Newington Baths offices:—

Higgins & Griffiths, Ltd. (Recommended.)	**£82**
A. Dean & Co., Ltd.	82
Girdlestone & Co.	103

HORNSEY.—Electricity Committee. Accepted:—
Lead service boxes and fittings (6s. and 7s. 2d. for boxes and 10s. 9d. and 9s. 3d. per set for fittings).—John Child & Co., Ltd.

METROPOLITAN ASYLUMS BOARD.—Works Committee. Recommended:—
Wireless installation at St. Luke's Hospital (£196).—Oxford Wireless Telephony Co., Ltd.

SOUTHWARK.—Electricity Committee. Recommended:—
One 6-retort Erith Roe stoker (£1,140).—Erith's Engineering Co., Ltd.
One Tri-tube economiser (£634).—Messrs. E. Green & Son, Ltd.

Middlesbrough.—Electricity Committee. Recommended:
Erection and equipment of new generating station (£131,809).—General Electric Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—
750-kW M.A.N. Diesel engine (£5,800).—J. R. Wright.
Reconditioning engine and erecting (£3,100).—Belliss & Morcom, Ltd.
Generator (£1,688).—Bruce Peebles & Co., Ltd.
Waste-heat boiler (£410).—Spencer-Bonecourt, Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

SCIALYTIC lamps for operating theatres.
MANNING BOWMAN electric irons (agent's name wanted).
COMBINATION coffee pot.
A well-known firm desires to get in touch with British makers of ¼ h.p., a.c. and d.c. motors for usual supply voltages.

Forthcoming Event.

British Association for the Advancement of Science.—Annual meeting at Oxford from August 4th to 11th.

Notes.

Educational.—UNIVERSITY OF BIRMINGHAM.—Session 1926-7. Faculty of Science. The course commences on October 4th. Syllabus with full particulars of University regulations, &c., can be obtained from the Registrar at the College. See our advertisement pages to-day.

Public Works Exhibition.—The Organising Committee of the Public Works, Roads and Transport Congress and Exhibition, is offering the following prizes for papers submitted for discussion at the Congress to be held in November, 1927:—1st prize, Gold Medal and £50; 2nd prize, Silver Medal and £25; 3rd prize, Bronze Medal and £10. The competition is open without restriction of nationality, and the subject must fall within the services covered by the Congress, that is to say:—Highways and bridges, water supply, sewerage and sewage disposal, cleansing, gas, electricity, housing and town planning, tramways and light railways, agriculture (small holdings, land drainage, land reclamation and agricultural education), and local government organisation. Papers must be submitted not later than January 17th, 1927. Application for the rules of the competition must be made to the Hon. Secretary, Public Works, Roads and Transport Congress, 84, Eccleston Square, London, S.W.1. Papers may be submitted for discussion at the congress without being entered for competition.

Engineering Exhibition.—The South Wales Institute of Engineers is making arrangements to hold an engineering exhibition in the Drill Hall, Dumfries Place, Cardiff, on November 24th to December 4th, 1926. The hall will be open from November 15th to December 9th to allow for the erection and removal of the stands and exhibits. The exhibition, which will be open at separate times for public and private view, will be arranged in eight sections for the various branches of engineering. Applications are invited from prospective exhibitors, to be sent to the Secretary of the Institute before September 30th.

Appointments Vacant.—Part-time (evening) lecturer in electrical design at Bradford Technical College; mains superintendent for Worksop Urban District Council. (See our advertisement pages to-day.)

The "Osram Pearl" Lamp.—The General Electric Co., Ltd., through the medium of its research laboratories which work in close co-operation with the "Osram" lamp works, is ever on the alert to improve the electric lamp. Besides the gasfilled lamp with its bright white light, the pipless bulb, and the "White" or colour-sprayed lamp, the latest development is a lamp bulb frosted on the inside. The idea is not a new one, but the process first tried left the bulb so fragile that the slightest knock would break it into pieces, the reason being that the surface of the etched glass was left jagged; by new treatment, however, the jagged edges are rounded off and the glass bulb is rendered as strong as a clear one. This latest type is called the "Osram Pearl" lamp, and it is suitable for practically every lighting purpose; it absorbs only 1 to 2 per cent. of the light, because internal reflections in the bulb are practically eliminated, and the inside frosting diffuses the light, protecting the eyes from glare and eliminating specular images.

Institution of Fuel Economy Engineers.—The Council has sent us a copy of a letter sent to all members of the Institution, definitely announcing its future policy, and indicating the progress of the autumn programme. The letter states that shortly after this Institution was incorporated, a movement was set on foot to establish an Institution of Fuel Technology, having objects which did not appear to differ materially from those of the Institution of Fuel Economy Engineers. The Council considered that it would be both unnecessary and undesirable if there were two rival institutions covering the same ground, instead of one strong and united body, and representations were made to the Organising Committee of the proposed Institution of Fuel Technology accordingly. Protracted negotiations have taken place with a view to a co-ordination of interests being arranged, but unfortunately these have proved abortive. Now that the Memorandum and Articles of the Institution of Fuel Technology have been published, it would appear that the only material difference is to be found in the qualification for membership. The Council considers that if any "Fuel Institution" is to be of national service, it is essential that admission to full membership should be restricted to those who are fully qualified technically, and that such membership should carry with it a definite status ranking with other premier institutions. The proposed Institution, on the other hand, is prepared to admit anyone who will pay his subscription. In these circumstances, the Council is energetically proceeding with the independent development of the Institution of Fuel Economy Engineers, and is now engaged in the completion of the autumn programme. This will include a series of lectures, informal meetings, and luncheons. Papers and lectures of the highest interest and importance have already been arranged to cover the period up to the end of January, 1927. The secretary is Mr. H. L. Pirie, 26, Victoria Street, S.W.1.

Chemical Plant Exhibition.—In connection with the Society of Chemical Industry's annual meeting and Congress of Chemists which were held in London last week, an exhibition of British chemical plant, organised by the British Chemical Plant Manufacturers' Association, was held at the Central Hall, Westminster, on July 19th to 24th. Generally, the exhibits were specially designed machines for various manufacturing processes, samples of different grades of metals and metal alloys, and the results of a number of chemical producing processes. While most of the machines were shown with electrical drives, which, in all cases, have proved to be particularly suitable for the work, few of the exhibits were of direct electrical interest. Among the most interesting of these was a portion of an electrolytic plant, now being erected in France at the Pierrefitte Works of the Société des Engrais Azotés et Composés, shown by the International Electrolytic Plant Co., Ltd. The plant, which is to consist of 800 Knowles cells (ELECTRICAL REVIEW, April 16th, 1926, p. 641), is believed to be the largest electrolytic hydrogen and oxygen producing plant in the world. It will have an output of 100,000 cu. ft. of hydrogen and 50,000 cu. ft. of oxygen per hour, and is intended to work in conjunction with a Casale plant in the manufacture of synthetic ammonia. Each cell is arranged for a working current of 7,500 A, the whole plant absorbing 15,000 kW. Messrs. International Combustion, Ltd., showed a model of the Raymond pulveriser powdering chalk. The pulverising, separating and conveying are all done by this machine in one operation. The plant is electrically driven, and a small electrically driven fan is employed for removing the pulverised material from the grinding chamber. A modification of this machine is used in connection with coal pulverisation. A number of samples of electrical resistance materials were shown by the Mond Nickel Co., Ltd., and Messrs. Henry Wiggin & Co., Ltd., including nickel-silver wire and a special high-grade resistance alloy with a specific resistance of 48 microhms per cm^3. The Thermal Syndicate, Ltd., showed some samples of pure fused quartz and 99 per cent. silica. The usual display of electrical distance thermometers and pyrometers was seen on the stand of Messrs. Negretti & Zambra. The Kestner Evaporator and Engineering Co., Ltd., displayed a section of a heat-exchanging plant. Messrs. Broom & Wade, Ltd., showed a variety of electrically-driven air compressors, including the "Typhoon" enclosed gear-driven machine. In this the double helical gearing is arranged as an integral part of the compressor so that high-speed motors can be employed directly coupled to the machine. A range of "Squeegee" pumps with self-contained electric motors was shown by the Avamore Pump Co., Ltd. An interesting exhibit was an acid-resisting concrete, "Prodorite," shown by Messrs. Prodorite, Ltd. This is a preparation in which Portland cement is replaced by specially prepared hard pitch, the materials being mixed at 250 deg. C. The material is claimed to be resistant to practically all acids except concentrated sulphuric and strongly oxidising acids. It can be made up in the form of pipes, tanks, and any sort of liquid container. It should prove suitable for accumulator boxes and pipes for the conveyance of corrosive liquids. An interesting method of electric drive was exhibited by Messrs. Thomas Broadbent & Sons, Ltd. The application is of a horizontally placed motor to a vertical centrifuge machine for hydro extraction. The motor is housed in the base of a swan-neck frame which carries the vertical bearing and driving pulley for the vertical shaft. The power is transmitted by belting and two small rollers change the direction of the belt at the top of the frame at right angles to both the horizontal and vertical drive. A model of a specially designed friction clutch, which is incorporated in several of the centrifugal machines, was shown. This is arranged so that for single-phase and d.c. shunt-wound motors, the shoes are controlled by springs which prevent any engagement until the motor has attained any predetermined speed up to 75 per cent. of full speed.

Inspection of Ferrybridge Power Station. — On July 24th, a joint delegation of the Yorkshire Associations of the Institutions of Civil, Mechanical, Electrical, County and Municipal, and Locomotive Engineers, at the invitation of the Yorkshire Electric Power Company, inspected the important new power station of the company now in the course of construction at Ferrybridge, near Knottingley. It was of special interest to see one of the turbines completely erected and the second only partially erected with its blading exposed to view. The increase in the demand for electrical energy in the company's area of supply is remarkable. In 1913 the capacity of the generating plant was 14,500 kW; by 1919 this figure was nearly doubled, and by 1925 the plant capacity had reached 53,500 kW. By the addition of the first section of the Ferrybridge station the total capacity will reach 91,500 kW. Ferrybridge is destined to become one of the most important capital power stations in the country, and, in view of prospective development, the company has acquired, not only a considerable area for future extensions to the station, but also properties near-by for the housing of the staff in Byram Park and at Brotherton Hall, where a hostel has already been opened, and where tea was served, after the inspection of the station, to some 200 visitors. Among those present were Mr. W. B. Woodhouse, M.I.E.E., and Mr. J. J. H. Stansfield, engigineer and manager, and secretary, respectively, to the company.

Dating of Patents Committee.—A committee has been appointed by the Board of Trade to consider whether any, and, if so, what change is desirable in the practice of (*a*) dating patents, applied for under Section 91 of the Patents Acts, as of the date of application in the foreign State; and (*b*) dating patents granted upon ordinary applications as of the date of application in the United Kingdom. The main question which the committee has to examine is whether this practice should be continued or whether patents granted upon applications made under Section 91 should bear some later date, such as the date of application in this country, or the date of grant of the patent, while still giving the applicant the priority as regards inventorship which must be given to him under international arrangements. The committee will be glad to receive suggestions or representations upon the matters covered by its terms of reference. In considering the questions involved, the committee desires that due regard should be paid to all the interests involved, *i.e.*, the interests of inventors, manufacturers, consumers, and the public generally. Communications should be addressed to the secretary to the committee, Mr. B. G. Crewe, Patent Office, 25, Southampton Buildings, W.C.2.

The Control of Public Utility Services.—The annual conference of the Institute of Public Administration was held at Oxford on July 23rd and 24th. One of the principal subjects discussed was the method of control of public utility services. Prof. Bonbright, of Columbia University, said that in the United States there had been a tendency for the States to take over the control of these services from the local authorities. That became especially necessary in the case of tramways which extended from one district into another through linking-up arrangements. In the case of railways the question was a larger one and the Federal Government had taken control. Administration was carried out by an impartial Public Services Commission, and it was considered that that system gave satisfaction. Opinions for and against municipal ownership were expressed. Mr. J. Dalrymple, general manager of the Glasgow tramways, said that the elimination of political interference would enable municipal officials to carry out their duties with more success. Sir Joseph Broodbank and Sir Geoffrey Clarke both maintained that the control of utility services by large bodies was unsatisfactory; one man, or at most a very small committee, was most successful. A protest was made by one speaker against the practice of municipal authorities taking money in relief of the rates from profit-earning undertakings.

Fatality.—Frederic Smith (52), labourer, of Liverpool, recently received a fatal electric shock. At the inquest on July 22nd it was stated that deceased was working with four other men at an electrically-driven coal conveyor loading wagons. During the loading of a wagon the machine stopped, and after it had been put right the men started to push it into the basement when they all received an electric shock and were knocked down. Mr. J. Shaw, engineer, Mersey Railway Company, said this was the first fatal accident due to electric shock since the electrification of the system. It was presumed that an abrasion in an electric cable had in some way caused the fatality. Deceased was wearing an oilskin coat which was wet, and some part of this might have touched the cable, causing the garment to become charged with electricity, or he might have put his hand on the cable where the abrasion in the insulation was and had thus come in contact with the live wire inside. Mr. G. P. Shallcross, Birkenhead Corporation electrical engineer, stated that the "live" wire in the cable carrying current at 650 V was exposed for about half an inch. A verdict of "accidental death" was returned.

Illumination Convention.—The twentieth anniversary convention of the Illuminating Engineering Society, America, is to be held at Spring Lake, New Jersey, from September 7th to 10th, inclusive, with its headquarters at the Essex and Sussex Hotel. A programme of diversified and comprehensive papers has been arranged by the Committee on papers, and a special feature of the programme will be a session devoted to the developments in the art of illumination which have taken place during the twenty years of existence of the Society. Another session will be devoted to the presentation and discussion of the Lighting Sales Manual, prepared by a joint committee of the Illuminating Engineering Society and the National Electric Light Association. The entertainment features of the programme have not been overlooked; the hotel and its surroundings are admirably adapted to provide the recreational features which have contributed so largely to the success of previous meetings.

Iron and Steel Institute.—The autumn meeting of the Institute will take place at Stockholm, by invitation of the board of directors of Jernkontoret, on August 27th and 28th. There will be visits to works and mines in Central Sweden, and included in the list of papers down for reading is one on "Electrochemical Potentials of Carbon and Chromium Steels."

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

At a meeting of the Blackpool Corporation General Purposes Committee on July 21st, a letter was read from Mr. CHARLES FURNESS, electrical engineer and tramway manager, regarding the action of certain members of the Council in leaving the Chamber when he was asked to explain matters connected with the dual control of both undertakings. Mr. Furness asked to be relieved of the duties of tramway manager forthwith. He stated in his letter that "to my surprise I was denied this courtesy (of explaining matters connected with dual control) by a substantial number of the members present, who left the room after the Committee had decided to hear my views on the proposal to sever the two departments. I respectfully submit that as your professional adviser upon all matters relating to electricity and tramways, I was entitled to more consideration. . . In these circumstances, and bearing in mind what has taken place recently, and during the past five years, I feel it would be most discouraging to me in future to attempt to carry on the dual policy which has for 16 years proved to be so successful. Therefore, I regret I have no alternative than to ask the Corporation to please relieve me of any obligations and responsibilities in connection with your tramways and transport at the earliest possible moment." The matter was further debated in all its bearings for over two hours, and a resolution asking Mr. Furness to reconsider his request to be relieved of the management of the tramways and transport services was carried by 22 votes to 18, an amendment by Alderman John Potter that Mr. Furness's request be acceded to, being defeated.

M. DININ, managing director of the Société des Accumulateurs Electriques, of Paris, has recently been appointed an Officer of the French Legion of Honour.

The West Hartlepool Corporation has appointed the borough electrical engineer, Mr. J. H. PARKER, to be manager of the Tramways Department as well, in succession to Mr. T. G. Richardson (who has received the Rhondda Valley appointment, as already announced). In combining the two appointments, Mr. Parker will receive an additional £150 per annum, and the Tramways Department will save £350 per annum.

Mr. E. R. WYNNE, A.M.I.E.E., has joined the board of Messrs. Lewenz & Wilkinson, Ltd., as co-managing director with Mr. H. I. Lewenz. He will look after the firm's home agencies and industrial electrification contracts.

Mr. H. E. HOLMES, publicity manager to Messrs. J. H. Tucker & Co., Ltd., is to be married on August 14th to Miss Mary Vaughton, a niece of Mr. W. S. Vaughton, electrical contractor, of Birmingham.

At the Worcester electricity works on Wednesday last week a presentation was made to Mr. C. W. SHAW on the completion of 21 years' service as electrical engineer. A bowling match had been arranged between the Electricity Committee and the employés, which resulted in a victory for the latter. The presentation, which then took place in the works institute, took the form of an armchair and an illuminated address for Mr. Shaw and a Worcester porcelain coffee service for Mrs. Shaw, subscribed for by the employés and the committee. The presentation was made by Mr. S. J. Roberts, and Mr. and Mrs. Shaw briefly returned thanks.

Mr. FRANK AULTON, traffic assistant in the Walsall Corporation Tramway Department, has been appointed traffic superintendent to the Bombay Electric Supply and Tramways Co., Ltd.

Obituary.—DR. A. FORSTER.—The death is reported from Berne, Switzerland, at the age of 83 years, of Dr. Aimé Forster, Professor of Physics and Meteorology at Berne University from 1869 to 1924.

SIR H. S. LEON.—Sir Herbert Samuel Leon, Bart., who died on Saturday last, at the age of 76 years, was chairman of the Yorkshire (West Riding) Electric Tramways Co., Ltd., the Anglo-American Telegraph Co., Ltd., and the Smithfield Markets Electric Supply Co., Ltd.

MR. F. FOWKES.—We regret to record the death, which occurred on July 18th, of Mr. Frederic Fowkes, formerly managing director of the Windermere and District Electric Supply Co. and Keswick Electric Light Co., Ltd. He was 82 years of age.

MR. C. A. COFFIN.—The *Electrical World* reports the death which occurred at Locust Valley, Long Island, N.Y., on July 14th, of Mr. Charles Albert Coffin, President of the General Electric Co. (U.S.A.), from its organisation until 1913 and chairman of its board from then until his retirement in May, 1922. He was 81 years of age.

Will.—The late Mr. A. J. COLLIER, retired superintendent of telegraphs, late of the Eastern Extension Telegraph Co., left £120,650 gross and £120,578 net personalty.

New Companies Registered.

British Radiophone, Ltd. (215,198).—Private company. Registered July 22nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in apparatus of all kinds relating to wireless telephony and telegraphy, &c. The subscribers (each with one share) are:—J. R. Orton, 5, Vermont Road, Upper Norwood, clerk; H. B. Secker, 207, Graham Road, Hackney, E.8, clerk. The first directors are not named. Secretary: B. Dees. Solicitors: Dixon & Hunt, 4, Verulam Buildings, Gray's Inn, W.C.1. Registered office: 101, Walmer Road, North Kensington, W.10.

Acocks Green Electrical Stores, Ltd. (215,196).—Private company. Registered July 22nd. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless, heating and lighting power, telegraphic and telephonic and general electrical or mechanical products, &c. The directors are:—C. B. Hemphill, Braemar, Coventry Road, Sheldon, near Birmingham; J. C. Edkins, "Dunstan Cottage," Coventry Road, Elmdon, near Birmingham. Qualification, 50 shares. Secretary: J. C. Edkins. Solicitors: Buller, Cross & Jeffries, 71, Temple Row, Birmingham. Registered office: Station Road, Acocks Green, Birmingham.

Insulation Manufacturers, Ltd. (215,178).—Private company. Registered July 21st. Capital, £10,000 in £1 shares. Objects: To acquire from G. Hadder the process for the manufacture of fireproof celluloid, insulated haddite and fireproof pure rubber solution, insulating powder and dental vulcanite; also to acquire from J. A. Liddell the process for the manufacture of artificial spread, pure rubber strip, ebonite and other formulæ for the manufacture of rubber goods, &c. The directors are:—G. H. Hadder (permanent managing director), 201, Widmore Road, Bickley, Kent; L. Stroud, High Boys, Chesham Bucks. Qualification, 500 shares. Solicitors: Geo. A. Baker & Robinson, Norfolk House, Laurence Pountney Hill, E.C.4. Registered office: Norfolk House, Laurence Pountney Hill, E.C.4.

Vinco Wireless Co., Ltd. (215,187).—Private company. Registered July 21st. £1,500 in £1 shares. Objects: To carry on the business of wireless manufacturers, in particular to acquire from Messrs. Richardson and Pearce the sole British manufacturing rights of their British patent No. 223,321 for reception without an aerial, together with all other wireless or kindred inventions which either of them may make, together with all improvements thereon, for 12 months from July 12th, 1926, &c. The subscribers (each with one share) are: A. A. Henley, 58, Alexandra Crescent, Bromley, incorporated accountant; J. G. Randall, 197, Fox Lane, Old Southgate, N.13, incorporated accountant. A. A. Henley signs as director. Remuneration, £50 each per annum. Solicitors: Lord & Co., 154, Bishopsgate, E.C.2. Registered office: 73, Basinghall Street, E.C.2.

The Llansilin Electricity Co., Ltd. (215,228).—Public company. Registered July 23rd. Nominal capital, £1,500 in £1 shares. Objects: To carry on in England or elsewhere the business of an electric light and power company in all its branches. Minimum cash subscription, seven shares. The directors are:—E. Hughes, Frydlin, Llansilin, gentleman (chairman), director of J. Meredith Jones & Sons, Ltd., and other companies; T. Smith, 28, Darlington Street, Wolverhampton, electrical engineer; T. Roberts, Tynyberth, Llansilin, landowner; W. Jones, Church View, Llansilin, farmer; W. Richards, Stanley House, Llansilin, cattle dealer; W. M. Roberts, Tynllan, Llansilin, farmer; H. T. H. Petters, Post Office, Llansilin, grocer; R. R. Lewis, The Cottage, Llansilin, farmer. H. T. H. Petters is the owner of an electric generating plant which the company proposes to purchase for cash, and owns land and buildings at Llansilin which the company proposes to lease at a yearly rent of £5. Qualification: £1. Secretary: E. Hughes. Solicitors: Evan Davies & Co., Wellington House, Buckingham Gate, S.W.1. The registered office is at the Post Office, Llansilin.

Richards, Walton, Ltd. (215,094).—Private company. Registered July 16th. Capital, £5,000 in £1 shares. Objects:—To acquire (1) the business of dealers in wireless apparatus carried on at Abbey Wood by A. Richards and J. B. Walton as "Lincoln Radio of London" and "Arnold Richards"; and (2) the business of manufacturers of, and dealers in wireless and electrical apparatus carried on by Abbey Industries, Ltd., at Abbey Wood Works, Abbey Wood. The directors are:—H. M. Smith, "Hill Top," Abbey Wood, S.E.2, engineer (director of Abbey Industries, Ltd.); A. N. Richards, "Red Roofs," Huntercombe, Taplow (secretary of Streamdale Laundries Ltd.); J. B. Walton, 81, Charlton Road, Blackheath, S.E.3 (partner in Lincoln Radio of London and Arnold Richards); W. H. Anstice, 54, Cranley Gardens, N.10, chartered accountant. A. Richards and J. B. Walton may retain office while holding 100 shares. H. M. Smith may retain office until he dies or he and/or Abbey Industries, Ltd., cease to hold 1,000 shares between them, with £100 per annum as remuneration. Remuneration of other directors and any further remuneration of H. M. Smith as determined by the company. Solicitors: C. Urquhart Fisher & Co., Cecil House, Holborn Viaduct, E.C.1. Registered office: 123, Cannon Street, E.C.

Thomas J. Digby Illuminating Engineering Co., Ltd. (215,068).—Private company. Registered July 15th. Capital, £20,000 in £1 shares (10,000 6 per cent. cumulative preference and 10,000 ordinary). Objects:—To acquire the business of an illuminating electrical engineer and contractor and general electrical engineer carried on by T. J. Digby. The directors are:—T. J. Digby, The Mill House, Bray, Berks., consulting electrical engineer (permanent chairman and managing director); H. Woodfield, 14, Park Drive, Sheen, electrical engineer; E. W. Harris, 7, Willow Avenue, Barnes, S.W., accountant. Qualification, £100. Remuneration as fixed by the company. Solicitors: Martin & Nicholson, 29, Queen Street, E.C.4. Registered office. 12, Gerrard Street, W.1.

Electric Transmission, Ltd. (215,124).—Private company. Registered July 17th. Capital, £10,000 in £1 shares. Objects:—To acquire a sub-lease of the "Culford Works," Kingsbury Road, Dalston, lately occupied by Twiss Electric Transmission, Ltd., and the goodwill of the business of the said company carried on thereat, and to carry on the business of electrical and general engineers, manufacturers, contractors, erectors and maintainers of plant for the generation, accumulation, transmission, and supply of electrical energy. The directors are:—R. C. Andersen, 6, Belgrave Place, S.W.1, electrical engineer; M. J. Dark, 51, Lewin Road, Streatham Common, S.W.16, electrical engineer; W. J. Kent, Eastwood Works, Hanley, Stoke-on-Trent, electrical porcelain manufacturer (chairman); A. E. Wilbraham Eastwood Works, Hanley, Stoke-on-Trent, electrical porcelain manufacturer; W. J. James, 115, Southend, Croydon, electrical engineer; H. S. Waite, The Old House, Sevenoaks, C.E. Taylor, Tunnicliff & Co., Ltd., of Eastwood, Stoke-on-Trent, may, while holding a majority of the shares, appoint three directors, including the chairman, M. J. Dark, W. J. Kent, and A. E. Wilbraham being the first three nominees. R. C. Andersen is managing director for seven years. Qualification, £100. No remuneration payable for first two years, thereafter as fixed by the company. Solicitors: Kent & Jones, Court House Chambers, Commerce Street, Longton, Stoke-on-Trent. Office: Culford Works, Kingsbury Road, Dalston, N.E.1.

Smith & Ancill, Ltd. (215,107).—Private company. Registered July 17th. Capital, £3,000 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in optical, electrical, electrotechnical, and similar articles and appliances, &c. The permanent directors are:—H. J. Smith, 37, Reverdy Road, Bermondsey, S.E.; G. C. Ancill, 15, Porchester Gardens, W.2 (both described as wholesale and manufacturing opticians). Qualification, 1 share. Secretary: H. J. Smith. Solicitor: C. S. P. Tufnell, 9, Gray's Inn Square, W.C.1. Registered office: 32, Furnival Street, E.C.4.

Official Returns of Electrical Companies.

Auto-Mechanical Rectifiers, Ltd.—Debenture dated July 8th, 1926, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: A. L. Ellis, Stafford House, Stafford Street, W.1, and Mrs. B. Ricketts, Bury Manor, Bury, Sussex.

Robins, Ltd.—Particulars filed of £2,000 debentures authorised by resolutions of June 15th and July 8th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,100.

Kent Brothers Electric Wire Co & E. H. Phillips, Ltd.—Issue on January 4th, 1926, of £5,500 debentures, part of a series already registered. (Registered July 17th, 1926.)

Singapore Traction Co., Ltd.—Trust deed dated July 14th, 1926, to secure £250,000 6 per cent. guaranteed first mortgage debenture stock, constituting a first fixed and specific mortgage on the traction undertakings authorised by certain ordinances or concessions, and all stations, power houses, generating stations, sub-stations, car sheds and depôts, and all lands, tenements, concessions, and hereditaments, real and immovable property of the company in Singapore, and all fixed plant, machinery, fixtures and fittings (other than tram tracks, permanent way, cables and fittings used in connection with the present tramway system), and all franchises, rights, powers and privileges held or enjoyed in connection with the tramway undertakings, and a floating charge on all other property and assets of the company, present and future. Trustees: Sir Bernard E. Greenwell, 2, Finch Lane, E.C., and J. S. Haskell, 2 and 3, Crosby Square, Bishopsgate, E.C.

Birkdale District Electric Supply Co., Ltd.—Satisfaction in full on July 12th, 1926, of debentures dated February 14th, 1905, and May 18th, 1915, securing £6,000.

Cox Cavendish Electrical Co., Ltd. (Old Co.).—R. J. Blackadder, of Norfolk House, 28, Norfolk Street, W.C.2, ceased to act as receiver or manager on July 15th, 1926.

Stensigns, Ltd.—Particulars filed of £8,000 debentures authorised May 28th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £5,000.

Young, Osmond & Young, Ltd.—Satisfaction in full on July 16th, 1926, of mortgage dated October 20th, 1925, securing £1,500.

Attaix, Ltd.—Mortgage debenture dated July 2nd, 1926, to secure all moneys to be paid by the mortgagee by virtue of a guarantee, limited to £500, given by him to the company's bankers, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: S. Rogers, 2, Rotunda Terrace, Montpelier, Cheltenham.

Ringwood Electric Supply Co, Ltd.—Further charge dated June 30th, 1926, to secure all moneys now or to become owing, not exceeding £15,000, inclusive of moneys secured by mortgage dated February 23rd, 1925. Property charged: Ringwood Mill, Ringwood; a fishing right, machinery, buildings, engines, &c., and leasehold land forming part of Ringwood Mill known as The Wilderness. Holders: Lloyd's Bank, Ltd. Also further deed of indemnity and charge of same date to secure all moneys inclusive of the moneys secured by a charge dated February 23rd, 1925, not exceeding £15,000 for which the chargees may become liable by virtue of guarantees given to the company's bankers. Property charged: Freehold and leasehold properties in Ringwood, Hants, and the company's undertaking and property, present and future, including uncalled capital, subject to existing prior charges. Holders: A. J. Abbott, "Strathmore," Westby Road, Boscombe, Bournemouth, and others.

Win-Sum Electric Diffusers, Ltd.—P. E. Slack, of 44, Bedford Row, W.C.1, was appointed receiver and manager on July 9th, 1926, under powers contained in first mortgage debentures dated February 2nd, 1926, in lieu of G. A. Siday, whose appointment has been revoked.

F C. Thornley, Ltd.—Debenture dated May 28th, 1926, to secure £1 00 charged on the company's undertaking and property, present and future, including uncalled capital. Also mortgage of same date to secure the above sum, charged on lease of 27 and 29, Tothill Street, Westminster. Holders: British Legal Life Assurance Co., Ltd., 2, Basil Street, Sloane Street, S.W.

Neutron, Ltd.—W. S. Dawson, of 31, Great James Street, W.C., ceased to act as receiver or manager on July 17th, 1926.

Tees Power Station Co., Ltd.—Satisfaction to the extent of £20,100 on various dates from October 31st, 1925, and June 30th, 1926, of debentures covered by trust deed dated May 7th, 1918, securing £600,000.

Dawlish Electric Light and Power Co., Ltd. (108,147).—Capital, £15,000 in £1 shares. Return dated July 2nd, 1926. 12,605 shares taken up. £12,605 12s. 6d. paid (including 12s. 6d. paid on 5 forfeited shares). Mortgages and charges, £2,750.

Mid-Cheshire Electricity Supply Co., Ltd. (46,958).—Capital, £150,000 in 68,775 ordinary, 60,525 7 per cent. cumulative preference, 10,000 5 per cent cumulative preference, and 10,700 unclassified shares of £1 each. Return dated April 9th, 1926. 68,775 ordinary, 60,525 7 per cent. preference, and 10,000 5 per cent. preference shares taken up. £138,475 15s. paid on 68,575 ordinary, 60,225 7 per cent. preference, and 10,000 5 per cent. preference shares, leaving £324 5s. in arrears. £300 considered as paid on 300 7 per cent. preference and 200 ordinary shares. Mortgages and charges, £29,000 (6 per cent. mortgage debentures).

Hendon Electric Supply Co., Ltd. (93,911).—Capital, £250,000 in 96,095 ordinary, 100,000 preference, and 53,905 unissued shares of £1 each. Return dated March 19th, 1926. 96,095 ordinary and 100,000 preference shares taken up. £196,130 5s. paid (being £1 per share on 100,000 preference and 56,833 ordinary, £2 6s. per share on (including premiums, £1 6s. and 15s. per share) 17,050 ordinary and £1 15s. per share on (including premiums, £1 6s. and 15s. per share) 47 ordinary shares). £22,165 considered as paid on 22,165 ordinary shares. Mortgages and charges, £58,000.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Prospectus.

Perak River Hydro-Electric Power Co., Ltd.—During this week a prospectus was issued by this company offering for subscription £1,275,000 of 7 per cent. participating debenture stock at £96 per cent., redeemable on or after June 30th, 1951, at £105 per cent. The stock will participate in profits up to a further 2 per cent. The company was formed mainly to supply electricity in the Kinta Valley (F.M.S.) tin-mining district, and has part of its capital guaranteed under the Trade Facilities Acts. It is stated that 72 of the more important mines in the district have stated their requirements as 97 million kWh per annum. The authorised capital consists of £1,250,000 of 5 per cent. debenture stock; £1,350,000 of 7 per cent. participating debenture stock; 500,000 8 per cent. cumulative preference shares of £1 each (which have been taken up by the Government of the Federated Malay States); and 500,000 ordinary shares of £1 each. The directors of the company are:—The Master of Elibank (chairman); Sir C. A. Montague Barlow, Bart.; Lord Meston of Agra and Dunottar, chairman of the Calcutta Electric Supply Corporation, Ltd.; Sir R. H. Brade; Sir Arnold Gridley, K.B.E., M.I.E.E., Controller, Electric Power Supply, Ministry of Munitions, during the war; and Col. B. C. Lockhart-Jervis, D.S.O., M.I.E.E., &c., a director of the Kensington and Notting Hill Electric Lighting Co., Ltd.

Ferguson, Pailin, Ltd.

Under date July 20th, a circular signed by Messrs. Kenneth Crossley, chairman, and Samuel Ferguson, managing director, was issued to the shareholders of this company stating that a communication had been received from Messrs. Price, Waterhouse & Co., Chartered Accountants, London, offering on behalf of one of their clients, to purchase the company's fully-paid 7 per cent. cumulative participating preference shares of £1 each at the price of £1 7s. 6d. per share and fully-paid ordinary shares of £1 each at the price of £2 13s. 6d. per share, provided that the total number of shares offered at the foregoing prices were not less than 75 per cent. of the total number of each class issued. The total issued shares consist of 60,000 7 per cent. cumulative participating preference shares of £1 each, and 90,000 ordinary shares of £1 each, all fully paid up, so that a minimum of 45,000 preference and 67,500 ordinary shares would have to be forthcoming if the purchaser's offer is to hold good. The circular stated that the directors had given very careful consideration to this offer and felt no hesitation in recommending its acceptance. They personally hold a large proportion of the company's shares and have agreed to release the whole of them at the prices offered.

Aluminium Corporation, Ltd.

The directors' report for the year ended December 31st last records a profit of £53,743, to which is added £23,990 brought forward, making £77,733. After charging debenture loan and mortgage interest, there is a debit balance of £13,734, which is carried forward. The report says that the disaster to the Eigiau dam has made a successful year's trading impossible, but the work of restoration has been vigorously carried on, and the works are now reinstated and running, although it has not yet been possible to complete the reconstruction of the Eigiau and low-level dams. Work on the new tunnel between Eigiau and Cowlyd Lakes is proceeding, and it is hoped to bring this into service early next year. With a view to ensuring an adequate supply of aluminium for the full operation of the company's rolling mill and the requirements of the company's many customers, arrangements have been made to obtain control of a further and ample supply of metal. The meeting was to be held yesterday (Thursday).

Marconi's Wireless Telegraph Co., Ltd.

The following is a copy of a circular recently issued to shareholders by the Secretary:—"My directors consider that, owing to the continued depreciation of certain of the company's interests in Associated and other Companies, a further revision of the values has become necessary. Pending the completion of the investigations into those undertakings now being carried out by the company's auditors (Messrs. Cooper Brothers & Co.) and by Sir Gilbert Garnsey, K.B.E., F.C.A. (of Messrs. Price, Waterhouse and Co.), the annual meeting of shareholders has been postponed. Notice of the meeting will be given in due course when the accounts for 1925 are ready. In these circumstances, although the results of your company's trading for the year 1925 show a profit, the directors do not consider that it will be possible to pay any dividend on the company's ordinary share capital for the year 1925. The intention of your directors is to secure that the profits arising from your company's operations shall not in future be diminished by losses which may be incurred owing to any possible future depreciation of its investments in Associated and other Companies."

North Wales Power Co.

A preliminary statement regarding the past year's working has been circulated to shareholders by the chairman. This shows that the profit is over £46,000 (an increase of £6,000), from which has to be deducted debenture interest amounting to £25,064. The sales of energy show an increase of over 22 per cent., and a number of important new consumers have signed agreements, and will take a supply as soon as the necessary connections can be made. The company has now 242 miles of transmission lines built, 136 miles under construction, and specifications for a further 74 miles, to complete the present scheme of 452 miles, are being prepared. It will at an early date have a continuous transmission system from Pwllheli to Runcorn, *via* Portmadoc, Cwm Dyli, Conway, Colwyn Bay, Hawarden, Wrexham, and Crewe—a distance of about 150 miles from west to east.

Tottenham District Light, Heat and Power Co.—The company has declared the half-yearly dividends on its preference stocks, and is paying interim dividends at the rate of 7½ per cent. per annum on the "A" stock and at the rate of 6¼ per cent. on the "B" stock, as compared with 7½ and 5¼ per cent., respectively, in 1925.

London Electric Supply Corporation, Ltd.—The dividend has been declared on the 6 per cent. preference shares for the six months ended June 30th. The ordinary shares receive a dividend of 9.6d. per share (at the rate of 8 per cent. per annum) for the same period.

Brompton and Kensington Electricity Supply Co., Ltd.—A dividend at the rate of 10 per cent., less tax, has been declared on the ordinary shares in respect of the half-year to June 30th. Last year the same rate was paid free of tax.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—An interim dividend of 5s. per share has been declared on the ordinary shares, as last year.

Vickers, Ltd.—The full half-yearly dividends have been declared on the company's preference shares and preferred stock.

Mather & Platt, Ltd.—An interim dividend of 5 per cent., free of tax, has been declared on the ordinary shares, as in 1925.

Metropolitan Railway Co.—The directors have declared an interim dividend of 1½ per cent. on the ordinary stock, as compared with 2 per cent. last year.

Stocks and Shares.

MONDAY EVENING.

THIS week, on Thursday, there will take place the meetings of the different classes of shareholders in the Underground Electric Railways of London. The meetings have been called to consider proposals for a re-arrangement of the share capital. It will be remembered that new shares of £1 each are to be offered in exchange for the existing shares of both classes. Put shortly, the proposals are to consolidate the existing capital of half-a-million £10 ordinary shares and 1,198,960 "A" 1s. shares, into 5,068,878 fully-paid £1 ordinary shares. The meetings will be of considerable importance to shareholders in the company, who have had plenty of time during which to digest the board's proposals. Criticism arose when these were first published, and it is possible that at the meeting on Thursday in this week the board will encounter some opposition to the scheme outlined.

Nevertheless, there is a general desire to place the share capital of the Underground Electric Railways of London upon a more satisfactory basis than has prevailed for many years past, and the board are likely to find their fellow proprietors desirous of meeting them in a spirit of co-operation and friendliness. The prices of the shares are harder on the week. It may be recalled that rumours of the above arrangement before the terms had been published caused a violent rise in the £10 shares, after which the quotation gradually sagged. If there be one point more than another upon which the directors' information is sought, it will revolve around the possibility of a dividend payment being made in the comparatively near future upon the new £1 shares that it is proposed to create. The position of the 6 per cent. income bonds will also be explained at the meeting.

London electricity supply companies are announcing their interim dividends, and in almost every case up to the present, the amounts have been the same as those of a year ago. The County, St. James', South Metropolitan, and South London companies have all declared interim dividends of 5 per cent. The Kensington's interim dividend of 5s. and the Metropolitan's 6 per cent. are unaltered, and the London Electric Supply Corporation will pay at the rate of 8 per cent. per annum, as it did a year ago. Notting Hill shares are to receive 4s. Brompton's 5 per cent. is less tax this year. So far as the list of share prices is concerned, the announcements have had no effect, but a good deal of curiosity is felt as to what the final dividends are likely to prove. Some people think that the companies will make up their dividends to the same as those of 1925, but others ask whether, in view of the operation of the new Act, the companies will be able in the current six months to re-adjust their capital accounts, according to the method laid down by the Commissioners and to bring their final dividends into accord with the provisions of the Act. Nothing definite seems to be known as to the progress which is being made by the companies towards the application of the new Act to the capital accounts, and it is pointed out that lawyers are not, as a rule, in a hurry to complete a task of this magnitude. Amongst the suburban companies, the Richmond (Surrey) has announced an interim dividend of 4 per cent. actual.

It is interesting to speculate upon the identity of the probable Chief Commissioner, or whatever his title may be, who will preside over the destinies of the industry in the future. Tentative offers have already been made in one or two directions, but without success. The names of several famous men are mentioned in the City as likely to be in the running. It is said that the salary is not likely to exceed £5,000 per annum.

The Treasury announces its willingness to guarantee to the North Metropolitan Power Station Company the principal and interest of a million pounds for 30 years for the erection, &c., of the company's proposed generating station at Brimsdown.

Marconis have come down heavily in price. A week ago they were standing at a pound. To-day (Monday) Marconi shares changed hands at 15s. and less. The company announces that it will be necessary to write off substantial amounts for depreciation, and that until the auditors, who are at present engaged on the work, have completed the accounts, it is not proposed to call a meeting. No dividend is to be paid. The company has made a trading profit, but all of this will have to go in satisfaction of the writing-down, the losses having been sustained apparently, so far as can be judged from the directors' statement, through investment in subsidiary and allied concerns. The news came as a keen disappointment. Many people are asking whether they ought to sell their Marconis, cutting the loss now in order to be finished with it. This would appear to be a counsel of despair. Where shares have cost considerably more than the present market value, it may be advisable to wait until the auditors have presented their report before a proprietor decides to cut his loss. Canadians have gone back to 3s. 9d. and Marconi preference to 1 1/16.

Prices of cable stocks are good. Eastern Telegraph is a point up at 19½, and the other quotations in this group are well maintained at their previous rises. United River Plate Telephones strengthened to 8 3/16. Several ex dividend markings occurred in this list last Thursday, and the deductions are being recovered by degrees.

Siemens are the most active, as well as the most interesting, shares, in the manufacturing group. Rumours came into circulation at the end of last week which caused a jump of half-a-crown in the price. Various companies are said to be contemplating an arrangement with Siemens, and it was upon the strength of this gossip that the sharp advance occurred. Other issues in this group are steady. India Rubbers rose to 23s. 9d. Edisons are better at 11s., but, on the other hand, English Electrics are heavy, and Metropolitan-Vickers preference have gone back. Telegraph Construction, continuing its monotonous course, strengthened to 29. The new Telephone Manufacturing shares, with 2s. 6d. paid, are 1s. discount. Ericssons preference went back a trifle to 21s. 6d., *i.e.*, 1s. 6d. premium. Engineering and allied issues are inclined to be a little firmer, partly on hopes of an early termination of the coal stoppage, partly by reason of the Vickers Company declaring dividends on various of its preference shares.

The foreign traction list is disposed to weaken in consequence of the mild fluctuations in the Paris exchange. Brazilian Tractions were depressed by the decline in the Belgian franc. British Columbia Electric preference gained a point at 86½. London and Suburban Traction preference have gone back to 5s. 6d. The rubber share market shows an easier tendency, it being assumed that the exportable allowance of the product will be left at 100 per cent., instead of being reduced, as was hoped might be the case, to 80 per cent., for the next three months' period which starts on Monday, August Bank holiday.

Share List of Electrical Companies.

	Nom. £	Dividend. 1924	Dividend. 1925.	Price July 26 1926.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14	14	55/9	−6d.	5 0 5
Brompton Ordinary	1	10	10	31/9	—	*6 6 1
Charing Cross Ordinary	1	15	15	45/9	—	6 10 10
do. do. 4½ Pref	1	4½	4½	17/-	—	5 5 11
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	27/-	—	5 18 6
County of London	1	15	15	59/6	—	5 0 10
do. do. 6 % Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	24/3	—	6 12 0
do. 7% Pref.	1	6	7	22/6	—	6 4 5
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	15	15	13⅞	—	5 9 1
Lancs. Light and Power	1	7½	7½	24/-	—	6 5 0
London Electric	1	10	10	32/6	—	6 3 1
do. do. 6% Pref.	5	6	6	5⅞	—	5 10 8
Metropolitan	1	11	11	37/-	—	5 18 11
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	21/-	—	5 18 1
Newcastle-on-Tyne Ordinary	1	7	7	22/-	—	6 7 3
do. 5% Pref.	1	5	5	18/-	—	5 11 1
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	16½xd	—	5 8 6
South London	1	15	15	2⅝	—	5 14 3
South Metropolitan Pref.	1	7	7	26/3	—	5 6 8
Urban Ordinary	1	4	7	1⅛	—	6 4 5
do. 6% Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	15	48/3	—	6 18 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/3	—	7 8 0
Yorkshire Elec.	1	8	8	27/-	—	5 18 6
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	70	+1	5 14 4
Metropolitan	„	5	5	64	+½	7 16 4
do. District	„	3½	3½	51xd	—	6 17 3
Underground Electric Ordinary	10	Nil	Nil	3⅞	+⅛	Nil
do. do. "A"	1/-	Nil	Nil	11/-	—	Nil
do. do. Income	Bonds	6	6	102	—	*5 17 10
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104xd	—	5 15 5
do. Def.	„	1½	1½	24½	—	6 2 5
Automatic Telephone	1	3	6	9½	—	4 0 0
Chili Telephone	5	5	6	6¾xd	—	*4 7 3
Cuba Sub. Ord.	10	5	5	6⅝	—	7 5 6
Eastern Extension	10	10	10	19⅛	—	*5 4 8
Eastern Tel. Ord.	Stock	10	10	191½	+½	*5 4 5
Globe Tel. and T. Ord.	10	10	10	19½	—	*5 4 8
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	27	—	7 7 1
Indo-European	25	8½	10	46½	—	*5 7 6
Marconi	1	10	Nil	15/-	−¼	... ...
Marconi Marine	1	10	7½	1	—	7 10 0
Oriental Telephone Ord.	1	12	12	45/-	—	*5 6 8
United R. Plate Tel.	5	8	8	8⅞	+⅛	*4 17 9
Western Telegraph	10	10	10	18½	—	*5 8 1
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	9⅛	−⅛	2 16 0
do. do. 2nd Pref.	5	6	6	2⅛	−⅛	10 18 4
do. do. 5% Deb.	Stock	5	5	74½	—	6 14 1
British Electric Traction Ord.	„	7	8	137½	—	5 16 5
do. do. 6% Pref.	„	6	6	110	—	5 9 1
Brazil Traction	100	4	5	102½	−1½	4 17 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	86½	+1	5 15 7
do. do. Preferred	„	96/-	126/9	107½	—	*5 17 11
do. do. Deferred	„	129/6	8	134	—	*5 9 5
do. do. Deb.	„	4½	4½	79	—	5 7 7
London & Sub. Trac. 5% Pref.	1	2½	Nil	5/8	−6d.	Nil
London United Tram. Deb.	Stock	4	4	47	—	8 10 2
Mexico Trams 5% Bonds	—	5	5	71½	—	6 19 10
Mexican Light Common	100	Nil	Nil	32½	—	Nil
do. Pref.	100	Nil	Nil	85½	—	Nil
do. 1st Bonds	—	5	5	79½	—	6 17 11
Yorkshire (West Riding)	1	5	—	11/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	13	51/-	—	*5 2 0
British Aluminium Ord.	1	5	10	47/-	—	4 5 1
British Elec. Transformer Pref.	1	Nil	7	18/9	—	7 9 4
British Insulated Ord.	1	15	15	3⅜	—	4 8 11
Brush Ord.	1	10	10	1½	—	6 0 0
Callenders	1	15	15	3½	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/3	—	... ...
Edison-Swan	4/-	10	10	11/-	+6d.	3 12 9
do. 5% Deb.	Stock	5	5	86	—	5 16 3
Electric Construction	1	10	10	32/-	—	6 0 0
Enfield Cable, Pref.	1	7½	7½	1⅛	—	6 6 4
English Electric	1	5	Nil	13/9	−9d.	... ...
do. do. Pref.	1	6	6	18/-	−1/-	6 13 4
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
„ Ord.	1	5	7½	28/3xd	—	5 6 2
Henley	1	16	20	3⅜	—	6 8 3
do. 4½% Pref.	5	4½	4½	4⅛	—	5 6 0
India-Rubber	1	5	5	23/9	+9d.	*4 4 3
Johnson & Phillips	1	10	17½	63/-	—	5 11 1
Met.-Vickers Ord.	1	8	8	24/6	—	6 12 0
do. Pref.	2	8	8	2⅜	−⅛	6 14 9
Siemens Ord.	1	7½	7½	29/6	+2/6	5 1 8
Telegraph Construction	12	20	10	20	+½	*4 2 9

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.		Price July 27th.	Fortnight's inc. or dec.
a Acid, Oxalic	per lb.	5¾d.	...
a Ammoniac, Sal	per ton.	£60	...
a Ammonia, Muriate (large crystal)	„	£52	...
a Bisulphide of Carbon	„	...	...
a Borax	„	£35	...
a Copper Sulphate	„	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a „ Perchlorate	„	5½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Commercial	„	£9 10s.	...
a „ Roll	„	£9 10s.	...
a Soda, Chlorate	per lb.	3¾d. to 3¾d.	...
a „ Crystals	per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton.	£120 to £125	...
b „ Wire	per lb.	1/9 to 2/6*	...
b „ Sheet	„	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net.	£259	£8 inc.
Grade II	„ „	£182	£7 inc.
Grade III	„ „	£99	£4 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	9¾d.	...
c „ Tubes (solid drawn)	„	11¾d. to 1/-	...
c „ Wire, basis	„	9¼d.	...
c Copper Tubes (solid drawn)	„	1/0½	...
c „ Bars (best selected)	per ton.	£90	...
c „ Sheet	„	£90	...
c „ Rod	„	£90	...
d „ (Electrolytic) Bars	„	£66 15s.	15/- inc.
d „ Sheets	„	£143 10s.	...
d „ „ Wire Rods	„	£76 15s.	15/- inc.
d „ „ H.C. Wire	per lb.	9¾d.	½ inc.
f Ebonite Rod	„	2/3 to 2/6	...
f „ Sheet	„	2/3 to 2/6	...
n German Silver Wire	„	2/2	...
h Gutta-percha, fine	„	8/-	...
h India-rubber, Para fine	„	1/7	¾d. dec.
l Iron Pig (Cleveland No. 3.)	per ton.	72/6	...
l „ Wire, galv. No. 8, P.O. qual.	„	£21	...
g Lead, English pig	„	£34 10s.	15s. inc.
g Mercury	per bot.	£15 7s. 6d.	...
e Mica (in original cases) small	per lb.	3d. to 3/-	...
e „ „ medium	„	4/- to 8/-	...
e „ „ large	„	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings	„	1/3½	...
p „ „ drawn bars & rods	„	1/3	...
p „ „ rolled strip & sheet	„	1/2⅝	...
p „ „ wire	„	1/3⅝	...
o Platinum	per oz.	£23 10s.	...
d Silicium Bronze Wire	per lb.	11¼d.	¼d. dec.
r Steel, Magnet, in bars	„	7¼d.	...
n Tin, Block (English)	per ton.	£288 5s. to £288 15s.	£11 10s. to £12 inc.
n „ Wire, Nos. 1 to 16	per lb.	4/2	1d. in.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

British Patents in the Irish Free State.—This matter is further dealt with in our "Legal" section this week. *The Times* reports that the executive council of the Institute of Patentees has considered the position of British patentees in the Irish Free State. The council decided that, as the case was *sub judice*, no immediate action should be taken. It passed, however, the following resolution:—"That in the event of the appeal not being upheld or the Irish Free State Parliament not giving facilities for the rapid passage of the proposed Bill, a deputation wait upon the British Government with a view to urging it to bring pressure to bear upon the Irish Free State Government to legalise the position of British patents in the Free State and furthermore to approach the Irish Free State Government direct on the subject in view of the number of members situated in the Free State who are holders of British patents."

Institute of Physics.—The report of the Board for the past year states that at the end of 1925 the corporate membership was 441, as compared with 428 in 1924. The total membership was 530. Dr. C. V. Drysdale was appointed editor of the *Journal of Scientific Instruments*, from September; its accounts show a credit balance of £56, contrasting with a debit of £126 in 1924. The accounts of the Institute show an income of £772, and an expenditure of £775, a deficit of £3 compared with £44 in the previous year. The Benevolent Fund stands at £145. As stated in Sir Charles Parsons's presidential address in 1924, "The principal function of the Institute is to certify qualifications in physics and its applications, and, to create a corporate spirit among physicists, the end in view being to raise the status of the physicist as a professional man, and to obtain for physics in every department of national and industrial activity the recognition and position which are due to it."

Italian Industry and Commerce.

Important Hydro-Electric Works.

A REPORT upon the commercial, industrial, and economic situation in Italy has been forwarded to the Department of Overseas Trade by Messrs. J. H. Henderson, O.B.E., and H. C. A. Carpenter, respectively Commercial Counsellor and Commercial Secretary at the British Embassy, Rome*.

The introduction to the report states that 1925 was in most respects a successful and satisfactory year for Italy. Arrangements were concluded for the settlement of war debts, the railways and postal services showed a profit for the first time for years, and the Budget surplus was the largest in the history of United Italy. Ample capital was found for industrial enterprises, notably the electrical and textile industries, and there was a boom in these shares, followed, however, by a period of reaction. The sterling exchange fell, but appeared to possess stability at the close of the year. With regard to foreign trade, both exports and imports increased in volume. Great Britain supplied a greater quantity of coal, but her other exports to Italy declined and she fell from second to fourth place in the list of exporting countries. Italian industries enjoyed a year of prosperity, there being practically no labour disputes, while the unemployment total fell to an unprecedented low level. Among other events of interest during the year may be mentioned the transfer of the telephones to private companies, the opening of an all-Italian submarine cable to South America, and the beginning of an extensive programme of improvements and public works to be carried out over a period of years, principally in Southern Italy.

Industry and Production.

As stated above, last year proved a good one for Italian manufacturers. There is still, however, a shortage of money, which it is being endeavoured to remedy by attracting foreign capital. It is impossible to foresee future development, but Italian manufacturers have to count on increasing difficulty in making sales in foreign markets, as well as on greater competition in the home market, on the part of their foreign competitors. Early this year, the Government issued a decree which forbade Government departments, municipal and communal authorities, Government-aided enterprises and all concerns directly or indirectly connected with the State, to purchase from foreign firms any requirements which could be procured from Italian makers, subject, however, to the proviso that the prices should not exceed the inclusive foreign prices by more than 5 per cent. (or in special cases, 10 per cent.). Although working at a small margin of profit, the engineering industries showed, in 1925, an intensive activity in almost all branches and increased their exports. In spite of this, imports of machinery have risen on account of the extensions and improvements effected and the increased demand for agricultural machinery. The only strike of a serious nature which occurred in 1925 was in the metallurgical trades, but this was promptly settled by Government intervention, the industry being ordered to grant such increased wages as would accord with the increased cost of living and its ability to pay.

Foreign Electrical Trade.

The report states that British manufacturers have still only a small share of the electrical apparatus trade of Italy, although the sales during 1925 were slightly better. Germany maintains her place but the home industry is steadily developing. Sweden is still selling vacuum cleaners and other domestic appliances more cheaply in Italy than elsewhere. An appendix to the report contains details of Italy's foreign trade during the last three years. These include particulars of electrical goods. It is shown that Great Britain's share of the trade in electric generators and motors was 300 quintals in 1924 and 800 quintals in 1925. Germany's share rose from 6,300 to 11,800 quintals; that of Hungary from 2,600 to 4,400 quintals; and Switzerland's from 1,200 to 2,500 quintals. With regard to miscellaneous electrical apparatus the United Kingdom supplied 300 quintals in 1924 and 600 quintals in 1925. The respective figures for Germany and Switzerland were 6,100 and 8,700 quintals, and 900 and 8,100 quintals. No telegraphic or telephonic apparatus is supplied by this country; Germany supplied 881 quintals in 1924 and 1,264 quintals in 1925. Our share of the steam-boiler imports showed the substantial rise of 13,800 quintals to 21,900 quintals, while Germany's share increased from 19,500 to 30,400 quintals. Germany and the United States shared most of the electric carbon trade. It is not stated whether the figures shown for Germany include deliveries on account of reparations; in 1925 7,944 quintals of machinery and apparatus were imported in this connection.

Difficulties and Methods of Trading.

As in other countries post-war conditions have been responsible for many trading difficulties which did not exist before or were not so pronounced. The principal is the fluctuation of the exchange. Many British firms protect themselves by selling in sterling, but there is then the danger of the Italian buyer defaulting if the exchange moves against him. It is hoped that the lira will soon be stabilised and this difficulty avoided, but in the meantime British firms are asked to consider quoting in currency, protecting themselves against loss by covering at a bank. This would lessen the danger of default and attract customers. Another difficulty is due to the presence in the market of unreliable speculative traders; the best remedy for this is a skilful local agent who can be trusted to make a careful selection of risks. Increased local production and the recent enactments which prescribe the purchase of local products where possible make the market for manufactured goods still more difficult. Competitive prices and reasonably generous credit terms are essential, and, above all, the knowledge of the market, which can only be acquired by personal study.

When payment is made by bill of exchange, it is advisable for the bill to be executed entirely in Italy, as it is not certain whether a bill drawn in England and accepted in Italy has full executive force. If the customer desires to inspect the goods before executing the bill, provision should be made for the goods to remain the property of the seller until the bill is handed over. Bills must also be correctly stamped according to Italian law.

The Production of Electricity.

Marked progress was made by the Italian electricity supply industry during 1925. The capacity of the generating stations was calculated at 1,360,000 h.p. before the war, and it reached a figure of 2,500,000 h.p. during 1923, 2,860,000 h.p. during 1924, and at the close of 1925 was 3,200,000 h.p. The total consumption has risen from 2,400 million kWh in 1914 to 7,600 million kWh. Only about 8½ per cent. of this is used for lighting, the bulk going to the railways and industrial establishments. The consumption per head varies a great deal, being about 400 or 500 kWh in the north, and only about 50 kWh in the south; the general average is now 185 kWh per head, as compared with 70 kWh ten years ago. There are over 2,000 generating stations, but only 400 of these are of recognised importance. The outstanding feature of the industry is the predominance of water power. Out of the total of 3,200,000 h.p. of plant only 580,000 h.p. is represented by thermal stations, and these are mainly used for stand-by purposes, as will be educed from the fact that out of a total production of 7,600 million kWh, only 300 million kWh was produced by steam plant. It is estimated that the total saving from the use of water power is two milliards of lire annually (the cost of 10 million tons of coal). Over a hundred large reservoirs and artificial lakes have been constructed, capable of accumulating, in the aggregate, 860 million cubic metres of water. A further 47 reservoirs, with a total capacity of 700 million cu. m., are under construction, while a similar number of hydro-electric stations, with an aggregate rating of 900,000 h.p., are also being built. It is estimated that the latter will all be completed in three or four years' time. Great attention is being paid at present to the exchange of energy between the various districts. At the end of 1925 there were over 45,000 km. of h.p. lines interconnecting various areas, in addition to the extensive local distribution systems. Large sums are necessary to finance the new power stations, reservoirs, and transmission lines. In 1914 507 million lire was invested in the industry, while now the investment amounts to 6,470 million lire, of which 1,800 million was added during 1925. Under the law providing for a subsidy of 40 lire per h.p. for 15 years to hydro-electric undertakings the Government may be called upon to provide about 38 million lire; the amount reached 20 million lire last year. The grant of the subsidy is limited to stations which are completed or in an advanced stage of construction at December 31st, 1928. For South Italy and the Islands the subsidy has been increased to 60 lire per h.p. To prevent public undertakings from coming under the influence of foreign capitalists a Public Utility Works Credit Institute has been formed. An issue of 300,000 six per cent. bonds of 500 lire each was made in 1925 by the Institute, and the proceeds were divided equally among three important hydro-electric concerns—Conti, Terni and Idroelettrica Veneta. It is understood that an American group proposes to invest $20 million in the Italian hydro-electric industry through the Institute.

Railway Electrification.

During the period under review 75 km. was added to the electrified portion of the State Railways, which now amounts to 855 km. out of a total of 15,760 km. A decree was published in August last authorising the expenditure of 60 million lire by the State Railways for the electrification of the Bolzano-Brenner line during the next two years; this line rises in 90 km. from 266 to 1,370 m. above sea level. A scheme has been mooted for the construction of an electric railway connecting Turin, Milan, and Genoa. There are many technical difficulties, but the question of finance is more difficult. It is proposed to commence with a line from Turin to Milan costing about 300 million lire, and taking about three years to complete. Negotiations are proceeding with the Swiss Federal Railways for the electrification of the Iselle-Domodossola railway.

*Stationery Office, 3s. 6d. net.

Modern Development of Paper-Mill Plant.

By W. WORBY BEAUMONT and LESLIE N. BURT.

(Abstract of a Paper read before the INSTITUTION OF MECHANICAL ENGINEERS.)

THE paper deals at length with the advances made in paper-mill machinery and describes some applications of the electric motor to this class of plant.

The use of electric motors for the machine drives has many advantages over belt or rope drives, provided the speed of the machine is sufficiently high to render complicated reduction gear unnecessary between the motors and the machine shafts. Even in machines of low speed it may be advantageous to substitute electric driving with a modern high efficiency reduction gear, so as to secure smoother running and ease of control.

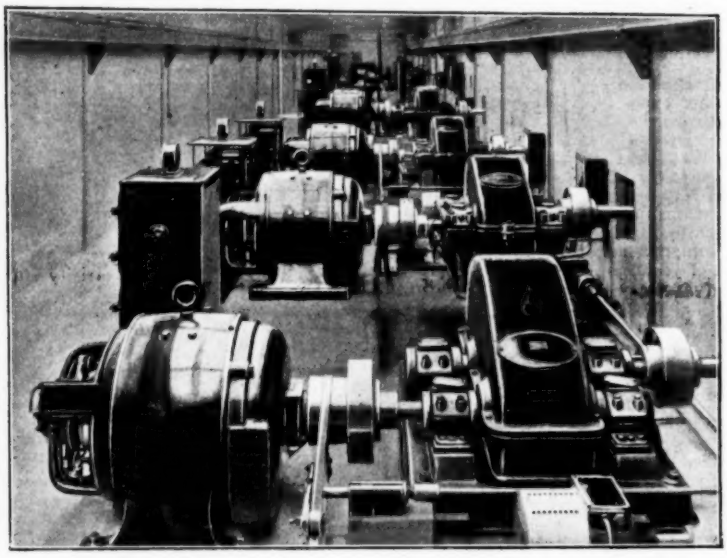


Fig. 1.—Harland Drive in Paper Mill.

In many instances where electric driving has been adopted in displacement of apparently successful methods, the resulting commercial efficiency has been sufficiently high to outweigh heavier capital outlay and lower electro-mechanical efficiency. In other words, a higher cost per horse-power-hour may result in bigger dividends. There are several systems specially designed for paper machine drives, namely, those of the General Electric Co. of America, the Westinghouse, the Harland, the B.T.-H., and others. The best known in this country, the Harland electric drive, is the invention of Mr. F. C. Warburton, and has already been applied to machines 90 to 232 in. wide, running at speeds varying from 100 to 1,200 ft. per min., and producing paper of as widely different character as "Kraft" and "Tissue." Fig. 1 shows an example of the system as applied to "news" machines producing finished paper 156 in. wide at 800 ft. per min. The motors driving the different sections of the machine are of the ordinary type of adjustable-speed d.c. motor. Referring to fig. 2 it will be seen that each motor M has at its commutator end a small cone-pulley marked P, and at the driving end a gear pinion or a coupling to transmit the power to the machine section. At the back of the machine is a light shaft A driven either by a small adjustable speed motor (the speed of which must have a range equal to that required for the machine), or by the dryer section. This is the master shaft, and by it the speed of the whole machine is regulated. At a little distance from each section motor there is fixed on this shaft a bevel or spiral gear B, driving through a similar gear B_1, a cross-shaft C on the end of which is a gear-wheel D, forming the sun-wheel of a differential. In line with the shaft C is a second shaft E carrying a second sun-wheel D_2 meshing with two pinions F, F_1, which with the sun-wheel D, complete the differential. At the opposite end of shaft E is a cone pulley P_1 similar to that on the motor by which it is driven through a light belt G. The shafts E and C are revolving in opposite directions, but normally at the same speed, and the casing H carrying the studs on which the pinions F, F_1 are rotatably mounted is free to revolve on the shaft C. Mounted on the casing H is a contact arm I carrying carbon brushes which make contact with the segmental plates of a shunt regulating resistance placed in the field circuit of the motor M. As long as the shafts C and E maintain equal speed, there is no movement of the casing and consequently no variation in the field circuit, but if for any reason the relation between the speeds of the two shafts is disturbed, the casing commences to rotate, the field current is increased or diminished until the speed of the motor M drives the shaft E at the same speed as shaft C, whereupon the movement of the casing stops. A belt-shifting gear N, actuated by a small hand wheel O on the front of the machine, moves the belt G to any required position and retains it there until further change of speed is required. As a rule the taper of the pulley is graded so as to give a speed range of 15 per cent. to 20 per cent. from the normal, but the increments of the range do not depend on the number of sections in the resistance. The British Thomson-Houston Co. has designed special a.c. motors for two or three-phase circuits, which enable a drive to be installed in those mills where it is desirable to keep to a single system of power supply. It is a variable-speed a.c. commutator motor having (normally) a shunt characteristic, and the speed change is effected by brush movement. The brushes are not merely moved around the commutator, but each motor has two sets of brushes on the same commutator carried on separate rings, and the speed is varied by moving one brush ring clockwise and the other anti-clockwise. Fig. 3 shows the arrangement of the windings and brushes. The primary winding is placed on the rotor and the secondary coils on the stator, the reverse to ordinary induction-motor practice. Further, the

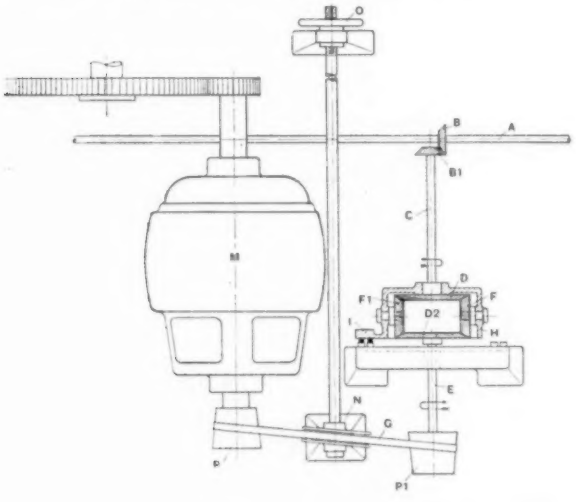


Fig. 2.—Principle of Harland Drive.

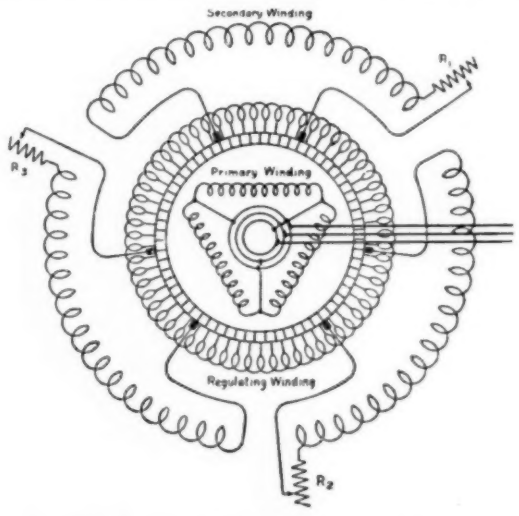


Fig. 3.—Arrangement of Windings and Brushes.

regulating winding is carried in slots in the rotor and connected, as in a d.c. armature, to the commutator. The ends of the secondary windings are connected to corresponding studs on each brush rocker, so that the further a set of brushes is moved from its corresponding set the greater will be the number of turns of regulating winding in series with the secondary winding. When the brushes are opposite one another the motor will run at slightly below synchronous speed; separating the brushes in one direction will increase, and in the opposite direction decrease, the speed. Additional regulation is provided by the use of the resistances R_1, R_2, R_3 when it is necessary to bring the motor down to a creeping speed. It may be necessary to point out that the commutator is only concerned with a fraction of the horse-power of the motor and hence, the currents and voltages being small, commutation troubles do not arise. Fig. 4 diagrammatically represents three sections of a complete machine drive. A, B and C are three motors driving, through gearing D, D_1, D_2, the machine units. Energy is taken from the three-phase supply mains E, through the main switches F, F_1, F_2 direct to the rotors carrying the primary winding. The mains also feed a constant-speed a.c. motor G, coupled to a d.c. generator H, and to a variable speed a.c. motor I, which is direct-coupled to an a.c. generator J. The two motor-generator sets GH and IJ are comparatively small and supply both a.c. and d.c. to the control gears K, K_1, and K_2 through the a.c. mains L and the d.c. mains M.

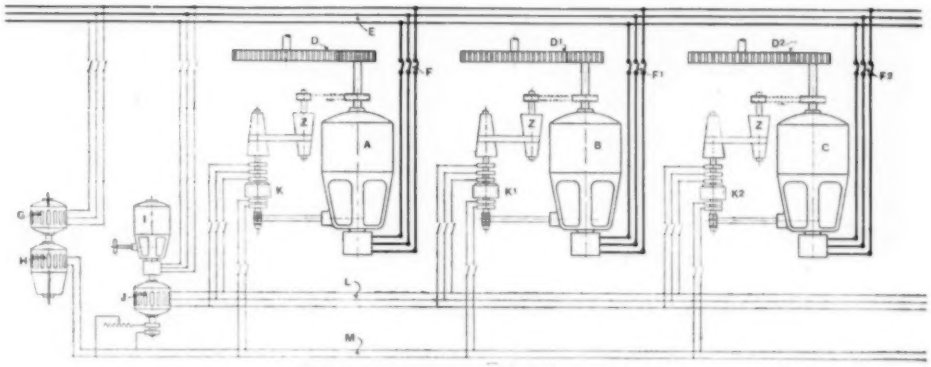


Fig. 4.—Complete 3-Section Machine Drive.

The motor-generator set IJ controls the speed of all the section motors A, B, C, as its own speed varies and consequently changes the frequency of the generator part J. Speed variation of the set is effected, as in the section motors, by shifting the position of the brushes as explained above, and this may be done by hand or, if remote control is required, by coupling a small pilot motor, through reducing gearing, to the brush ring. To make clear in what manner the speed of the section motors is changed, the control gear K must now be considered, as this is employed whether the speed of the whole paper machine or only one of its sections needs to be varied.

The field coils are excited by d.c., so that if the rotor received three-phase a.c., it would rotate in the usual way, provided the field rings were held fast, because the three-phase current produces a rotating field. If the rotor were held stationary and the field ring free to rotate on current being supplied to the rotor, the field would rotate. Now in the case under consideration, the field ring is free to rotate, current is being supplied to the rotor at the same time as it is being driven—but in an opposite direction—and at the same angular velocity as that of the rotating field. The result is that the field ceases to rotate and interlocks with the field produced by the d.c. in the coils of the field ring, retaining the field frame in a definite fixed position.

Should any interference disturb the relation between the driven speed of the rotor and the speed of the rotating field, the magnetic balance between the rotor and the field ring would be upset and rotation of the field frame commenced.

From this it will be seen that movement of the field frame and consequent movement of the brush ring can happen if the speed of the a.c. motor-generator be altered, if the speed of the section motor changes, or if the belt driving the cone pulley be shifted.

The Electrical Imports of Argentina.

THE Argentine Government has recently issued detailed statistics of the country's foreign trade in 1924. The following table shows the values of the various descriptions of electrical materials imported in that year and in 1923, together with a note of increases or decreases. The values are the Argentine Customs Tariff valuations; the gold peso = about 4s.

	Gold Pesos. 1923.	Gold Pesos. 1924.	Inc. or dec.
Clamps or porcelain tubes—			
Total *	28,000	16,000	– 12,000
Pushes and electric bells (returned by dozens)—			
Total *	5,000	10,000	+ 5,000
Electric bells (returned by units)—			
Total *	20,000	48,000	+ 28,000
Carbons for arc lamps—			
Total *	5,000	11,000	+ 6,000
Electric meters—			
Total	487,000	463,000	– 24,000
From Germany	409,000	251,000	– 158,000
,, France	1,000	35,000	+ 34,000
,, United Kingdom	31,000	106,000	+ 75,000
Small electric motors for fans, &c.—			
Total	86,000	115,000	+ 29,000
From Germany	48,000	50,000	+ 2,000
,, United States ...	22,000	44,000	+ 22,000
,, United Kingdom	10,000	12,000	+ 2,000
Electric batteries—			
Total	238,000	375,000	+ 137,000
From Germany	21,000	58,000	+ 37,000
,, United States ...	183,000	253,000	+ 70,000
,, United Kingdom	22,000	35,000	+ 13,000
Materials for cells or storage batteries—			
Total	177,000	272,000	+ 95,000
From Germany	38,000	126,000	+ 88,000
,, United States ...	58,000	77,000	+ 19,000
,, United Kingdom	29,000	40,000	+ 11,000
Porous jars for batteries—			
Total	8,000	7,000	– 1,000
From United Kingdom	6,000	5,000	– 1,000
,, France	2,000	2,000	—
Glass jars for cells and storage batteries—			
Total	5,000	8,000	+ 3,000
Plugs—			
Total *	26,000	8,000	– 18,000
Wall sockets—			
Total *	8,000	12,000	+ 4,000
Circuit breaking devices, such as "wall fuse sockets"—			
Total	10,000	36,000	+ 26,000
From Germany	7,000	27,000	+ 20,000
,, United Kingdom	1,000	4,000	+ 3,000
,, United States ...	2,000	2,000	—
Insulating tubes—			
Total	349,000	472,000	+ 123,000
From Germany	125,000	200,000	+ 75,000
,, United States ...	68,000	89,000	+ 21,000
,, United Kingdom	127,000	169,000	+ 42,000
Lampholders—			
Total	140,000	142,000	+ 2,000
From Germany	105,000	124,000	+ 19,000
,, United States ...	23,000	13,000	– 10,000
,, United Kingdom	6,000	3,000	– 3,000
Apparatus for radio-telephony (included with "telephone material" in 1923)—			
Total		416,000	—
From United States ...		258,000	—
,, France		56,000	—
,, Germany		44,000	—
,, United Kingdom		38,000	—
Apparatus for radio-telegraphy (included with "telegraph material" in 1923)—			
Total		8,000	—
From Germany		6,000	—

* Mainly from Germany.

	Gold Pesos. 1923.	Gold Pesos. 1924.	Inc. or dec.
Accessories for underground cables—			
Total	42,000	156,000	+ 114,000
From Germany	14,000	14,000	—
,, United Kingdom	6,000	60,000	+ 54,000
,, United States ...	19,000	5,000	− 14,000
Electrical accessories—			
Total	610 000	800,000	+ 190,000
From Germany	261,000	229,000	− 35,000
,, United States ...	105,000	93,000	− 12,000
,, United Kingdom	223,000	385,000	+ 162,000
Accumulators—			
Total	111,000	117,000	+ 6,000
From United States ...	36 000	55,000	+ 19,000
,, United Kingdom	68,000	52,000	− 16,000
Insulators of earthenware, faience, or porcelain—			
Total	173,000	174,000	+ 1,000
From United Kingdom	27,000	34,000	+ 7,000
,, Germany	139,000	132,000	− 7,000
Glass insulators—			
Total	3,000	2,000	− 1,000
From United States ...	2,000	1,000	− 1,000
,, France	1,000	1,000	—
Wires and cables—			
Total	3,844,000	5,530,000	+1,686,000
From Germany	1,686,000	2,214,000	+ 528,000
,, United Kingdom	1,122,000	2,053,000	+ 931,000
,, United States ...	571,000	436,000	− 135,000
Ammeters and voltmeters—			
Total	79,000	94,000	+ 15,000
From Germany	22,000	37,000	+ 15,000
,, United States ...	48,000	49,000	+ 1,000
,, United Kingdom	6,000	4,000	− 2,000
Telephone apparatus—			
Total	224,000	270,000	+ 46,000
From Germany	60,000	91,000	+ 31,000
,, United States ...	84,000	36,000	− 48,000
,, United Kingdom	66,000	116,000	+ 50,000
Telephone material—			
Total	714,000	31,000	− 683,000
From Germany	73,000	3,000	− 70,000
,, United States ...	404,000	10,000	− 394,000
,, France	127,000	2,000	− 125,000
Telegraph material—			
Total	126,000	45,000	− 81,000
From Germany	98,000	—	− 98,000
,, United Kingdom	15,000	28,000	+ 13,000
,, United States ...	8,000	14,000	+ 6,000
,, France	4,000	2,000	− 2,000
Switchboards—			
Total	23,000	34,000	+ 11,000
From Germany	6,000	10,000	+ 4,000
,, United States ...	4,000	10,000	+ 6,000
,, United Kingdom	12,000	13,000	+ 1,000

	Gold Pesos. 1923.	Gold Pesos. 1924.	Inc. or dec.
Switches—			
Total	112,000	182,000	+ 70,000
From Germany	90,000	117,000	+ 27,000
,, United Kingdom	4,000	16,000	+ 12,000
,, United States ...	13,000	20,000	+ 7,000
Electric fans—			
Total	19,000	58,000	+ 39,000
From Germany	5,000	9,000	+ 4,000
,, United States ...	3,000	12,000	+ 9,000
,, Italy	8,000	30,000	+ 22,000
,, United Kingdom	2 000	5,000	+ 3,000
Insulating tape—			
Total	66,000	114,000	+ 48,000
From Germany	18,000	9,000	− 9,000
,, United Kingdom	3,000	6,000	+ 3,000
,, United States ...	42,000	68,000	+ 26,000
Commutators (returned by weight)—			
Total	1,000	1,000	—
From United Kingdom	1,000	1,000	—
Commutators (returned by no.)—			
Total	11,000	11,000	—
From United Kingdom	8,000	3,000	− 5,000
,, Sweden	2,000	4,000	+ 2,000
,, Belgium	—	2,000	+ 2,000
Cut-outs, safety fuses, and circuit breakers—			
Total	21,000	30,000	+ 9,000
From Germany	14,000	16,000	+ 2,000
,, United Kingdom	1,000	3,000	+ 2,000
,, United States ...	5,000	8,000	+ 3,000
Electric bell indicators and telephone switchboards—			
Total (all from Germany)	5,000	7,000	+ 2,000
Vulcanised fibre—			
Total	23,000	33,000	+ 10,000
From Germany	2,000	5,000	+ 3,000
,, United Kingdom	4,000	5,000	+ 1,000
,, United States ...	12,000	22,000	+ 10,000
Dynamos and motors—			
Total	1,129,000	1,555,000	+ 426,000
From Germany	652,000	717,000	+ 65,000
,, United States ...	124,000	178,000	+ 54,000
,, Italy	125,000	172,000	+ 47,000
,, United Kingdom	87,000	223,000	+ 136,000
Incandescent lamps—			
Total	1,434,000	658,000	− 776,000
From Germany	642,000	171,000	− 471,000
,, Holland	689,000	349,000	− 340,000
,, United States ...	41,000	44,000	+ 3,000
,, United Kingdom	26,000	32,000	+ 6,000
Electrical material not elsewhere mentioned—			
Total	559,000	693,000	+ 134,000
From Germany	220,000	217,000	− 3,000
,, United States ...	197,000	240,000	+ 43,000
,, United Kingdom	97,000	167,000	+ 70,000

The Electricity (Supply) Bill.

The Proceedings in Committee.

(*Concluded from page* 161.)

THE concluding portions of the Electricity (Supply) Bill were considered by Standing Committee "C" of the House of Commons on July 19th. Sir Robert Sanders again presided.

The Committee dealt with the First Schedule, which contains provisions as to the acquisition of generating stations and main transmission lines. Mr. ATTLEE (Limehouse, Lab.) moved to omit a substantial portion of the Schedule, so as to provide that the price of a generating station or main transmission line "shall be such sum as may be certified by an auditor appointed by the Electricity Commissioners to have been the amount of the expenses incurred as and incidental to the provision of the generating station or main transmission line, less depreciation on a scale to be fixed by Special Order. Provided that if the owners of the generating station or main transmission line, or the Board are dissatisfied with the sum so certified, the matter in dispute shall, in default of agreement, be determined by an arbitrator appointed by the Minister of Transport." He pointed out that, as originally drawn, the Schedule provided for two separate methods of calculating the price of a generating station or main transmission line, one being for joint electricity authorities or local authorities, and the other being for companies or persons. In the first case the amount was to cover the liabilities, interest and sinking fund charges in respect of sums borrowed. In the other, it was the cost of the main transmission line, expenses incurred in the provision of a generating station, less depreciation. In the case of a local authority, the money would, probably, have been raised on loan, and a local authority was bound actually to pay off its capital expenditure. He wanted the two types of authorised undertaker to stand on exactly the same footing.

Sir D. HOGG, the Attorney-General, said that the First Schedule dealt with the acquisition of generating stations under Clause 5, when the owners of generating stations refused to work them, and also it dealt with acquisition of main transmission lines under Clause 8, where the Board could acquire main transmission lines belonging to authorised undertakers on notice given. The Government did not want to make it too tempting for either local authorities or private companies to sell their generating stations. It was no part of their design to try to make it profitable for an existing undertaker to refuse to work his undertaking, and to put the selected station on to the Board for it to find someone else to work it. On the other hand, of course, the Committee would realise that, inasmuch as the undertaker had a right to say to the Board: "I will not work the station," it was only fair that, on that being said, a fair price, but not an extravagant price, should be paid to the person who put himself in that position. The Government thought that it was doing the fair thing, so far as

the local authority was concerned, when, in the First Schedule, it provided that the amount which was to be paid in the event of the authority's refusing to work a station—and similarly for a main transmission line—should be the amount outstanding of the cost of the erection of the station. But the Commissioners who were advising the Government thought it extremely unlikely that any local authority would refuse to work the station. He hoped that belief was well-founded, but in the unlikely event of their refusing, the Government had no objection to providing that, whether the local authority or the private company was the body which refused to work the station, the amount to be paid for it should be the expenses incurred in its provision, less depreciation on a scale to be determined by the Electricity Commissioners. He would therefore accept the amendment.

Mr. BALFOUR (Hampstead, U.) said it was clear that injustice must arise if these two different types of undertakings were bracketed together.

After further debate, the amendment was agreed to.

Sir F. HALL moved an amendment to provide that the price paid for a generating station or main transmission line should include "such further sum as will reimburse the company or person for any loss sustained by reason of the acquisition of such station or line."

Sir D. HOGG regretted that he could not accept the amendment, which was negatived.

Mr. ELLIS (Wakefield, U.) moved to insert the following proviso:—"Provided that if the generating station replaces another generating station the outstanding debt (if any) on such last-mentioned generating station shall be included in the sum to be certified."

Sir D. HOGG said that meant that where a station had become obsolete without having its value written off by the owner, who then put up a new station, if he compelled the Board to buy he should be able to make the Board pay something for his worthless old station. That did not seem to be fair.

The amendment was negatived, and the Schedule, as amended, was agreed to.

The Committee then adjourned.

On July 20th, the Committee considered the Second Schedule, which sets forth rules for determining the cost of electricity at selected stations. Mr. HARDIE (Glasgow, Springburn, U.), moved an amendment that the rate of interest on share and loan capital to be taken into account in the case of a selected station owned by a company, should not be more than 5 per cent., instead of, as provided in the Schedule, not less than 5 nor more than 6½ per cent.

Col. ASHLEY, the Minister of Transport, in resisting the amendment, said that, in its desire to get cheap electricity, the Government must not do an injustice to the people who had put their money, legitimately, into the business, and had received a certain rate of interest in the past. In the Schedule the Government was therefore taking an average rate of interest.

Mr. ATTLEE said that in 1923, in the case of the London companies, the average rate of interest and dividends was something over 8 per cent.—it ranged from 16 per cent. down to not quite 5 per cent. The Labour Party maintained that the rate should be calculated strictly on the basis of the interest on capital.

The amendment was negatived by 17 votes to six.

On an amendment moved by Mr. HANNON (Moseley, U.), Lt.-Col. MOORE-BRABAZON, the Parliamentary Secretary to the Ministry of Transport, explained that with regard to the London companies the London agreement stood in so far as the family arrangements were concerned—the rate of interest, the sliding scale, and all those intricate arrangements which came into force on the setting-up of the J.E.A. for London. But he had said that when the national scheme came across the path of London it must have preference over any internal arrangements in London. He was satisfied, however, that the position of the London companies would not be disturbed under the Schedule.

The following provisos, moved by Col. ASHLEY and Mr. HANNON, respectively, were agreed to:—"Provided that where part of the expenditure was defrayed otherwise than by means of loans, the allowance for depreciation shall be increased by such amount as the Electricity Commissioners think just." "Provided also that in the case of any company which is a London company within the meaning of the London and Home Counties Electricity District Order, 1925, the amount of such allowance for depreciation shall not be less than the contributions for the year of account which the company is required to make to the sinking fund under the provisions of the London Electricity (Nos. 1 and 2) Acts, 1925."

The Schedule, as amended, was agreed to

On Schedule 3, which deals with authorised charges and allowances in respect of transmission lines used for giving bulk supply to authorised undertakers, the Committee agreed to an amendment, moved by Col. ASHLEY, to ensure that the charges and allowances should include everything properly chargeable to the transmission line. Col. Ashley also promised to "tidy up" a number of matters on the report stage.

Three further amendments, moved by Col. ASHLEY, Mr. HANNON, and Sir J. NALL, as follows, were also agreed to:—"Provided that, where part of the cost of the construction of the transmission line was defrayed out of revenue, the allowance for depreciation shall be increased by such amount as the Electricity Commissioners think just." "Provided that in the case of any company which is a London company within the meaning of the London and Home Counties Electricity Order, 1925, such average rate as aforesaid shall be taken to be the average rate of the interest payable by the company and of the dividend which such company is entitled to retain or distribute in the year of account under the provisions of the London Electricity (Nos. 1 and 2) Acts, 1925, but shall in no case be taken to be less than six and a-half per cent., together with an addition to cover the company's proportion of the Board's expenses, and a proper proportion of any co-partnership benefit payable in such year under the said Acts or either of them." "In this Act the expression 'transmission line' when used with reference to a line which is a main transmission line shall have the meaning given to the expression 'main transmission line' by the Electricity (Supply) Act, 1919, and when used with reference to a line which is not a main transmission line shall include any works necessary to, and used for, the control of the transmission line and the transmission of electricity thereby and the buildings or such part thereof as may be required to accommodate those works."

On the question that the Schedule, as amended, be agreed to, Col. ASHLEY intimated that the report and third reading stages of the Bill would not be taken until the autumn.

The Schedule, as amended, was agreed to.

Schedule 4 provides the form and basis of compensation for permanent officers or servants of an authorised undertaking, who may be retrenched, removed, or worsened, in the position of their employment as a result of the Act, through the closing of a generating station or its acquisition by the Central Board.

The Schedule was agreed to, with some slight amendment, and the Committee adjourned.

A short sitting of the Committee on July 22nd was sufficient to finish the proceedings.

Schedule 5 (Amendments of Schedule to the Electric Lighting (Clauses) Act, 1899) was agreed to.

On Schedule 6 (Minor Amendments of Electricity (Supply) Acts, 1882-1922) it was agreed that Clause 15 of the Act of 1919 should be amended as follows:—"In any order authorising the abstraction of water from any reservoir used by any statutory water undertaker for the purposes of the undertaking there shall be inserted such provisions as the Minister of Health (or in the case of Scotland the Scottish Board of Health) may consider proper for safeguarding the interests of the water consumers, and no such order shall be made without the consent of such undertaker, which consent shall not be unreasonably refused, and subject to such terms and conditions as may be agreed, any question as to the reasonableness of such refusal or as to the terms and conditions to be laid down shall, failing agreement, be referred to a sole arbitrator to be named by the Lord Chief Justice or in Scotland by the Lord President of the Court of Session."

The Schedule, as amended, was agreed to.

On Schedule 7 (Rules for determining the fixed charges component of the running charges component), Lt.-Col. MOORE-BRABAZON moved to omit the proviso which states that "The amount of the fixed costs divided by the number of kilowatts of maximum demand shall be the fixed charges component," and to insert:—"One-twelfth of the amount of the fixed costs in the year of account, divided by the average of the monthly maximum demands in that year, shall, subject to such variations whether by way of decrease or increase as the Electricity Commissioners may by regulations prescribe, according to the magnitude of the maximum demands of supplies furnished, be the fixed kilowatt charges component.

This was agreed to, as was also a further amendment moved by Lt.-Col. MOORE-BRABAZON, to leave out the following words (which, followed directly on the previous amendment):—"For the purposes of this provision the 'number of kilowatts of maximum demand' shall be deemed to be twice the largest number of units of electricity supplied from the generating station during any consecutive thirty minutes in the year of account," and to insert:—"Provided that if the number of kilowatts of maximum demand so ascertained for any particular month shall be less than the number of kilowatts of maximum demand for any previous month of the same year of account the higher number shall be taken as the number of kilowatts of maximum demand for the first-mentioned month."

The Schedule, as amended, was agreed to, and, after the usual compliments, the Bill was ordered to be reported to the House.

The report and third reading stages of the Bill in the House of Commons and all the stages of the Bill in the House of Lords will not take place until after the summer recess. There have, in all, been no fewer than 28 sittings of the Committee.

Reliability of Automatic Sub-stations.—Included among the many things which were put to the test during the recent general strike was electrical equipment of every description, as in numerous instances it was impossible to give even the most perfunctory supervision. A notable case, demonstrating the reliability of plant manufactured by the British Thomson-Houston Co., is afforded by the following particulars concerning the behaviour of an automatic sub-station containing two rotary converters, each of 1,200 kW capacity, and automatic control equipment. This automatic sub-station is one of many engaged in supplying current to the track for electric-railway service, and its behaviour is typical of all: The user's report is that "within three minutes of the receipt of instructions to start up the service, the sub-station was put on load, and it operated right through the strike without any attention whatever, either in the way of oiling, inspection, adjustment, or anything else. A superintendent looked into the sub-station for a few minutes at the end of the first week, but beyond that no visits were paid to the sub-station."

Large Circuit Breakers for Canada.

New Heavy-Current Switchgear made by Messrs. Ferguson, Pailin, Ltd.

HEAVY-duty, oil-immersed circuit breakers of a normal current-carrying capacity of 4,000 amperes at 15,000 volts have recently been manufactured for their Canadian trade by Messrs. Ferguson, Pailin, Ltd., who claim to have successfully surmounted the design difficulties encountered in dealing with extra-high-voltage currents of this magnitude.

Heat tests of the gear indicated that the temperature rise was well within the limits laid down by the British Engineering Standards Committee, the results obtained being shown by the curve in fig. 1, while fig. 2 is a reproduced photograph of the 3-phase breaker complete with electrical operating mechanism. It comprises three single-pole units, mounted on a self-supporting built-up angle- and channel-iron framework braced to resist distorting forces. Normally the electrical operating mechanism is housed in a structure at the end of the breaker on the floor, and wire-rope tank-raising and lowering mechanism is incorporated in the frame-work.

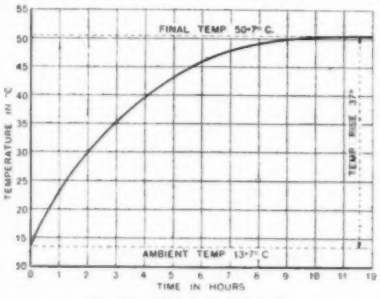


Fig. 1.—Temperature Chart.

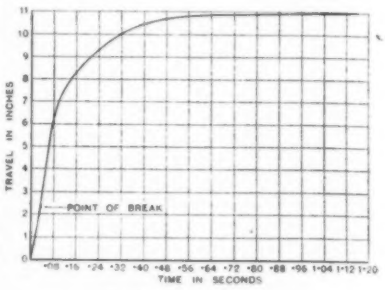


Fig. 3.—Time-Speed Chart.

Each single-pole unit is provided with a dome-shaped top plate of non-magnetic material, in order to reduce eddy current losses, which accommodates the internal operating mechanism and allows an air space above the oil level. Welded boiler plate is used for the tanks, which are cylindrical with dished bottoms; they are fastened to the top plates by steel cradles and down rods, the latter being jointed to allow the cradle to swing clear and the tanks to be removed. A gasket between the tanks and top plate prevents oil throwing, and one large-capacity vent is fitted to each single-pole switch; this is baffled in addition to being fitted with an oil and gas separator, which returns any ejected oil to the tank when the pressure has subsided.

The terminal bushings consist of bakelised copper tube, provided with ventilating features and fitted with suitable strip connectors at the upper end. The lower end carries the gun-metal casting to which the contact fingers are fixed. Standard contacts of the finger and inverted V-bar type are employed; two contact bars in parallel per phase are used, the apex of the V being truncated to obtain maximum oil circulation. The arcing contacts are of special design, and have a large thermal capacity.

The operating mechanism is of the internal type, but the common countershaft which operates all three poles is mounted externally. A special feature is the design of the accelerating and buffering arrangement whereby, despite the large mass of the moving parts, a high speed of break is obtained without shock or strain on the mechanism, as is indicated by the time-speed chart shown in fig. 3. Accelerating springs ensure a high initial speed; after a portion of the travel has been completed the buffering device comes into operation, comprising a piston-type oil dashpot from which the oil is allowed to escape through two small holes, which are partially closed towards the end of the travel, thus increasing the resistance so that the moving parts are brought smoothly to rest. The switch contacts and dashpot gear are shown in fig. 4.

The circuit breaker is designed to be primarily motor-operated, and emergency hand-operating gear is also fitted. The circuit breaker, complete with operating mechanism, weighs approximately 5½ tons.

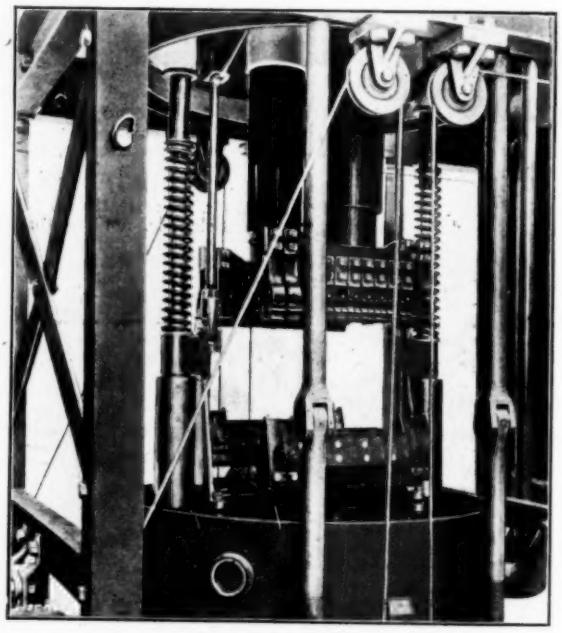


Fig. 4.—Switch Contacts and Dashpot Gear.

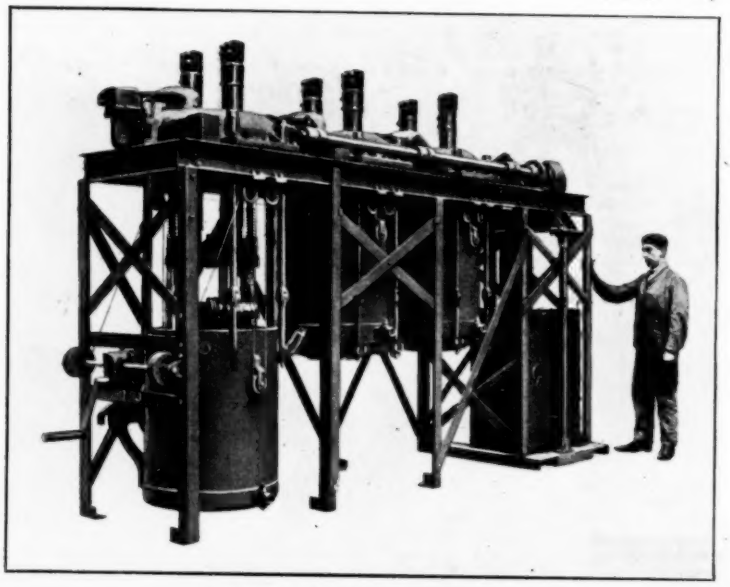


Fig. 2.—Complete 3-phase Circuit-Breaker.

Mercury Vapour Poisoning. — Evidence in support of the asserted dangerous effects from the inhalation of mercury fumes is given in some observations made in *Science*, which may prove interesting to mercury meter testers and mechanics. During a period of research experiments by Prof. Alfred Stock, of the Kaiser Wilhelm Institute, he developed chronic troubles of the nose, throat and intestines, which were aggravated as time went on by increasing nervousness. His memory and powers of concentration also grew weaker and weaker, and no permanent benefit was derived from the treatment prescribed by his physicians. Collaborators in his laboratory were affected in the same way. In consequence it was decided to readjust laboratory conditions so that as little free mercury would be exposed to the air as possible. An efficient ventilating system was also installed. In the course of a few months the various ailments fell off gradually, and after a period of years health in some cases was completely restored.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

An Electric Grinding Machine.

The accompanying illustration, fig. 1, is of the "Turner-Macraf" grinding mill, which is being marketed by MESSRS. E. R. & F. TURNER, LTD., Ipswich, for the grinding of cereals such as maize, beans and wheat. Two motors of the "Bull" design are direct-coupled to the mill shaft, one on each side,

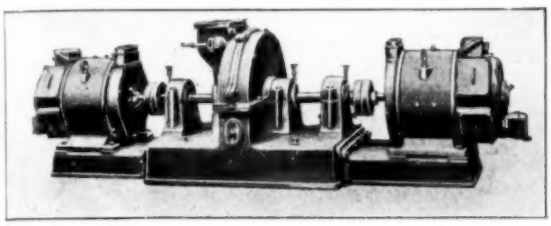


Fig. 1.—Electric Grinder.

each running at 1,900 r.p.m. on 440 V, d.c. They are pipe ventilated and fitted with ball bearings. The machine is made in three sizes with 15-in., 21-in., and 24-in. plates, the respective motor sizes being 10, 20, and 30 h.p.

A Coil-Ignition Replacement Unit.

The advantages of the coil-ignition method over the magneto system for automobile ignition have perhaps been outweighed by the expense and trouble involved in changing over to the coil-ignition principle. With a view to overcoming this drawback MESSRS. DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, London, S.W.1, have produced the "Remy" coil ignition magneto replacement unit which is designed to render the change-over a simple and quick operation. Fig. 2 shows the

Fig. 2.—Coil-Ignition Device in Position.

device fitted in position on a Morris engine in place of the magneto. The new apparatus fits exactly in the position occupied by the magneto element. It consists of a standard Remy distributor and a suitable coil for the particular system of wiring used, earth-return or insulated. The two units are mounted on a standard magneto base, which is equipped with the necessary drive shaft, gears, and ball bearings.

A New Phase Advancer.

The increasing practice of supplying electricity at charges varying according to the power factor of the installation has interested users of electricity in the question of power factor improvement, an important advance in which is represented by a new phase advancer which has been developed by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, is based on the phase advancer designed for the company by Prof. Miles Walker, about 16 years ago, but improvements have made possible a greatly simplified construction, resulting, it is claimed, in lower first cost and maintenance expenses, greater reliability, and better operating characteristics. The new machine is a simple a.c. exciter, similar to the d.c. exciter which is connected in the rotor circuit of a synchronous induction motor, except that it has a series instead of a shunt field winding. The series-field arrangement gives the apparatus a self-regulating characteristic, so that the pressure generated by the exciter increases with the load on the main motor. The current circulating in the phase-advancer circuit is produced by the resultant of the e.m.f. induced in the rotor of the main motor and that generated in the advancer armature, the arrangement of the circuit being such that these two e.m.f.'s assist one another. If the load on the main motor increases, the slip and the consequent e.m.f. increases, and also, therefore, the resultant e.m.f. This causes a corresponding increase in the current circulating, which, since the phase advancer is wound with a series field, results in an increase in the pressure generated by this machine. These two pressures rise until the current circulated is strong enough to produce the required torque in the main motor, the phase advancer being so designed that this current is automatically produced with the desired amount of phase compensation. On systems where a new motor is to be installed, the phase advancer is most conveniently arranged on a common bedplate, directly coupled to the motor as shown in fig. 3, while for use with existing motors the advancer can be driven by a small auxiliary motor, or arranged for belt or chain drive from the existing motors or a convenient line shaft. The power factor compensation is, of course, varied by rocking the advancer brushgear, the necessary positions for the brushes being marked on the machine. For the improvement of power factor on plant where extensions are not contemplated, the installation

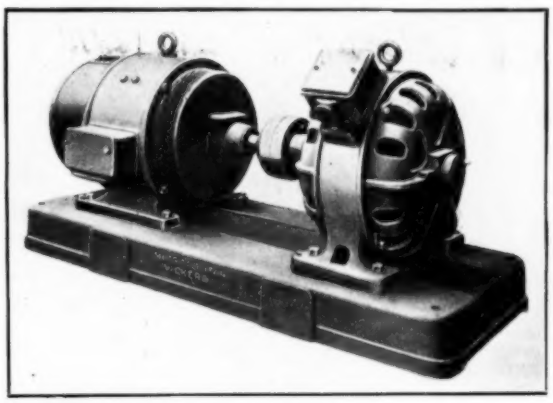


Fig. 3.—New Phase Advancer.

of a separately-driven phase advancer, it is claimed, will in most cases be found the most effective and economical solution, provided that one or more motors of at least 35 to 40 h.p. are available for compensation. Where extensions are to be made the phase advancer used in conjunction with an induction motor shares the field of economical application with the salient-pole synchronous motor and the synchronous induction motor, depending largely upon the degree of compensation required. With medium sized units, *e.g.*, between 40 and 300 h.p., the use of phase advancers will in many cases, it is claimed, give the necessary compensation at the lowest cost. One important advantage offered by the phase advancer is that it enables the consumer to use the ordinary robust type of slip-ring motor.

The new machine is of simple construction and consists of only three main parts, the stator, rotor, and a 3-arm brush rocker. The pressure generated in the machine is only about 25 V.

An Improved Switch.

The MIDLAND ELECTRIC MANUFACTURING CO., LTD., Bradford Street, Birmingham, has sent us some particulars of its latest production, the "Glasgow-Rex" switch, which has been de-

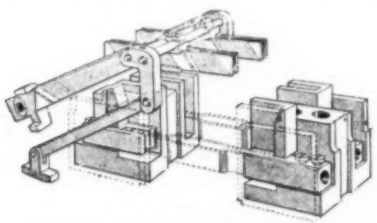


Fig. 4.—The "Glasgow-Rex" M vement.

signed to meet the new I.E.E. regulations, and which is the outcome of a decision to re-design the old "Glasgow" heavy-duty switch. It has a simultaneous double break on each pole, thus increasing, it is claimed, the effective speed of break, minimising the arc, and making possible the safe breaking of heavy excess currents. The movement, fig. 4, has been improved so that it is now rapid, certain, and smooth, with no shock to the switch base or blades. The contacts are fully shrouded so as to minimise the possibility of arcing, and the main insulating material is a strong and highly vitrified china.

Magnetic Changes in Iron and Steel.

The Result of the Investigation of Heat Treatment Below 400 Deg. C.

By W. H. DEARDEN and C. BENEDICKS.

(Abstract of a paper read before the IRON AND STEEL INSTITUTE.*)*

THE paper deals with investigations by the authors into the changes in the magnetic properties of iron and steel brought about by different heat treatment. The magnetic properties of iron being known to be rather sensitive to physical and molecular changes, it appeared probable that, if low-temperature changes did actually exist, there should be parallel changes in its magnetic properties. A photographic method, on the magnetometer principle, was used to register directly the temperature-magnetisation curves of the specimens, thus obtaining a continuous and sensitive record, practically independent of the observer. The disposition of the various components of the apparatus used is shown in fig. 1. A beam of light from a pin-hole in the front of the lamp A was passed through a condensing lens B and reflected through an angle of about 30 deg. by the plane mirror of a moving coil galvanometer. The beam then passed through a totally reflecting prism arranged to transform horizontal deflections due to the galvanometer into vertical motions. Finally the light was reflected through about 60 deg. at the surface of the mirror in the magnetometer M and, passing down the camera C, produced a spot of light on a sheet of bromide paper which registered the motion of the spot during an experiment. The magnetometer mirror registered as horizontal deflections of the beam of light the motion of the specimen, itself used as the magnetometer needle, as it was heated while suspended in an horizontal position in a constant magnetic field, and at about 45 deg. with the direction of the latter. Simultaneously the galvanometer and prism gave the beam of light a vertical deflection nearly proportional to the temperature of the specimen, measured by a thermocouple placed immediately below it. Hence the spot of light traced a curve, with magnetisation as abscissæ and temperature as ordinates.

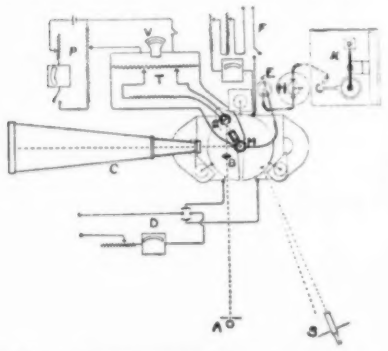


Fig. 1.—Photographic Magnetometer Apparatus.

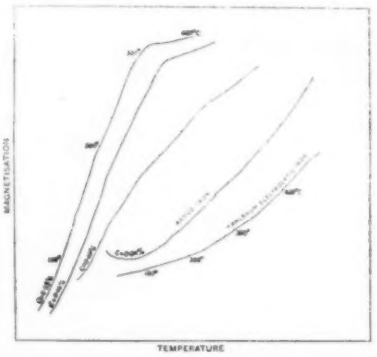


Fig. 2.

Of the three circuits shown in fig. 1, D belonged to the electromagnet, giving the constant magnetic field; the furnace was heated by alternating current in the circuit F. The thermocouple circuit T was slightly more complicated. Of the e.m.f. generated by the thermo-junction, the main part was utilised in the direct reading millivoltmeter V, while a small fraction of the remainder was employed to deflect the galvanometer G. By means of the circuit P, known e.m.f.'s could be impressed on the thermocouple circuit, to enable the sensitivity of the registering galvanometer to be adjusted, and also to ascertain that the instrument was swinging freely.

During the experiments the magnetometer was exhausted to a pressure of just under 0.1 millimetre by a Volmer mercury pump E, which worked in front of a large glass bottle H, kept at a pressure of 1.0 millimetre by means of a Leybold hand-pump K.

The external field was set up in the gap of a large Hartmann and Braun electromagnet and kept constant at 15 gauss. The diameter of the pole faces was 93 millimetres and the gap width 79 millimetres. For fields between 2,500 and about 2 gauss it was found that, within a cylinder 30 millimetres in diameter described about the axis of the poles, the magnetic field was quite uniform and symmetrical; change in the earth's field had no effect on the magnet field, even when the latter was as low as 2.25 gauss.

During a registration the temperature of the specimen was raised about 20 deg. C. per minute and the temperature calibration of the curves was obtained as follows:—

The illuminating lamp was switched out when the pyrometer on the control table registered a temperature of 5 deg. C. lower than 100 deg. C., and switched on again when it registered 5 deg. C. above. This was repeated for 200 deg., 300 deg., and 400 deg. C. On the final curve the 100 deg. C. point, for example, could be located at the centre of the first gap in the curve.

The registration was usually carried up to 459 deg C. The furnace having cooled again, the specimen was brought back to its orginal magnetic condition by reversing it twelve times in the magnetic field, and then turned to the standard position and the experiment repeated. The same paper was kept in the camera, which was moved about 2 cm. horizontally to prevent the curves from coinciding.

Three main series of experiments were carried out with metals annealed at 910 deg. C., quenched from 910 deg. C., and quenched from 910 deg. C. and reheated to about 500 deg. C.

The curves in fig. 3 represent some of the results of the first mentioned experiments on specimens of two German electrolytic irons (one from Kahlbaum), an "Armco" iron, and three low-carbon steels of 0.05, 0.16 and 0.23 per cent. content. In the curve for "Armco" iron the effect of the introduction of carbon is at once seen; the curve passes through a very marked angular point at 215 deg. C.

Fig. 2 shows the curves obtained from specimens quenched from 910 deg. C. The Kahlbaum electrolytic iron shows two angular changes, both resulting in increasing the magnetisation. The "Armco" iron shows irregular results. The 0.10 per cent. steel has a somewhat ill-defined bend at about 325 deg. C., and two weak angular points at about 120 deg. C. and 215 deg. C. It will be seen from fig. 4 that the curves for the steels which were hardened and then reheated to 500 deg. C. are strikingly similar to those for the annealed steels, fig. 3.

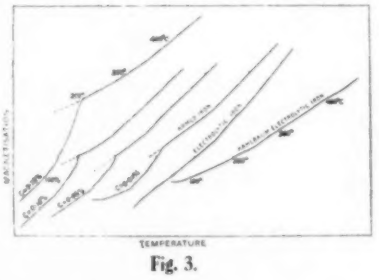


Fig. 3.

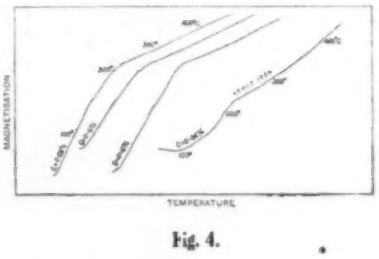


Fig. 4.

Diesel Engine Users' Association.—VISIT TO WORTHING.—During the past few years it has become the custom of the General Committee of the above Association to visit an undertaking administered by a member of the Association. In furtherance of this idea the Committee visited Worthing on July 9th, where the undertaking is in charge of Mr. Geoffrey Porter, A.M.Inst.C.E. The plant installed in connection with both alternating and direct-current supply systems is equipped chiefly with "full" Diesel engines; fuel injection is ensured by means of compressed air in contra-distinction to the method adopted at Maidenhead (visited last year by the Committee), where injection proceeds solely under the control of pumps. First started in 1901 to serve a population of 20,000 inhabitants, the plant has now a capacity of 2,995 kW; a 250-kW steam set alone represents the older type of equipment. This set has been used only for three-quarters of an hour during the past two years, when it was found desirable to get rid of a quantity of coal dust and other rubbish. The population served to-day approximates to 45,000, and the total capital expenditure at March 31st, 1926, stood at £218,467, of which sum £61,170 represents the cost of machinery; loans to the extent of £79,275 have been redeemed. During the past financial year the plant generated 2,754,000 kWh, the cost of generating per kWh sold being 0.9d. The afternoon was spent in visiting work in progress in the country districts, including 11,000-volt, 3-phase, a.c. transformer sub-stations supplied from the Worthing power station, and two of the Corporation's electrically-driven water-pumping stations. Another pumping station is in course of completion, where electricity will be the sole motive power. On returning to Worthing, the party was entertained at tea by the chairman of the Electricity Committee, Councillor F. W. Mitchell.

South African Electrical Notes.

(From Our Special Correspondent.)

A NOVEL way of celebrating the second birthday of the Johannesburg Broadcasting Station took place on the evening of June 30th, when a special relay of all the three South African stations was arranged for all listeners in South Africa. Short speeches were given from Johannesburg by the Minister of Posts and Telegraphs, the Administrator of the Transvaal, the Mayor of Johannesburg, and the Chairman of the A.S. & T. Broadcasting Co., Ltd., followed by instrumental music. This was followed by a short speech from Cape Town by the Mayor and a musical programme. Durban then had its turn with a speech from the Mayor and music by the Durban Orchestra. These relays concluded with a unique event as far as South Africa is concerned, namely, a duet with the piano accompanist playing at Durban and a violinist in Johannesburg, perfect time being recorded. The item was excellently received by listeners all over the country. The distance from Durban to Johannesburg is approximately 500 miles, while Johannesburg to Cape Town is about 900 miles, or a total distance of about 1,400 miles over the ordinary telephone land lines in which there are a number of repeaters in circuit.

The June issue of the *S.A. Engineer* was largely devoted to the applications of electricity to domestic consumers. It contained an article by the pioneer of electric cooking in S.A., Mr. John Roberts, borough electrical engineer of Durban, in which the author showed that the consumption of energy in Durban had risen from 460 kWh per head of population in 1916, to as high as 718 kWh in 1924. He was very optimistic and estimated that a figure of 1,000 kWh per head would soon be exceeded.

Congella (Durban) Power Station.

With the Electricity Supply Commission's acceptance of the tender of Messrs. Pauling & Co., of Johannesburg, for the building and foundation work of the Congella power station, this long-deferred large undertaking has now been commenced as from July 1st, and it is anticipated that the station will commence a supply towards the end of 1927. The following contracts have also been placed in connection with the principal portion of the plant:—Boiler plant and building, International Combustion, Ltd.; turbo-generators and condensers, C. A. Parsons & Co., Ltd.; switchgear, A. Reyrolle & Co., Ltd.; station transformers, Siemens Bros. & Co., Ltd. The site of the power station is adjacent to the main Natal railway line and close to the Graving Dock at the head of the Bay (from which condensing water will be drawn) and about three miles from the centre of the town. The local manager for the Electricity Supply Commission is Mr. John Roberts, borough electrical engineer of Durban.

Notes from Canada.

(From Our Special Correspondent.)

THE various scattered mining districts of Northern Ontario are all dependent on electric power obtained from different hydraulic developments. In order to ensure continuity of supply the transmission lines serving the various centres have lately been interconnected and the important mining centres, Porcupine, Gowganda, Cobalt, South Lorrain, and Kirkland Lake, are now linked up with sources of power supply aggregating about 76,000 horse-power, with the possibility of the development of some 40,000 horse-power more at one of the existing sites. A transmission line to supply power to the new Noranda mining centre near Rouyu in Quebec from this site is at present under construction. The power supply of this region is under the control of the Power Corporation of Canada, which has absorbed the various individual companies which formerly existed.

A recent issue of the *Electrical News* illustrates a bronze medal which is awarded by the Canadian Electrical Association, to any employé of a Public Utility in Canada who is successful in resuscitating, by the "Prone Pressure" method, anyone suffering from the effects of electric shock. Fourteen awards have been made so far, and it is interesting to note that the metal of which the medals are made is taken from the transmission line running from Three Rivers, Quebec, to St. Narcisse, Quebec—said to be the first high-pressure line constructed in the British Empire.

An important step towards the development of power on the St. Lawrence River was taken in Toronto recently, when officials of the Power Commission of the State of New York met the Premier of Ontario (the Hon. Howard Ferguson) and officials of the Hydro-Electric Power Commission of Ontario, to discuss preliminary matters. On two points, according to the daily papers, there was complete agreement—*viz.*, that this development is absolutely necessary and that it is essential to commence the work at the earliest possible moment. Both sides recognised that agreement between them was necessary so that the two Federal Governments concerned might be approached with a united front in regard to a proposed scheme of development. It was felt that, if such agreement could be reached, the Federal Governments referred to would not oppose the immediate prosecution of the work. Two plans are under consideration, and the engineers of both parties are at present studying them. The Ontario Government favours a development with two dams, one at Morrisburg creating a head of 48 feet and the other at Long Sault with a head of 28 feet. This scheme has the advantage that only about 6,000 acres of land would be flooded and the expenditure of capital could be spread over a longer period, thus keeping pace better with the growth of load in Ontario. On the other hand, the New York State representatives apparently prefer a single-stage development at the foot of the Long Gault Rapids, creating a head of 75 feet, but in this case the area flooded would be about 30,000 acres and several villages would be submerged, involving much greater expense in compensation to owners. New York State, however, would, it is said, be ready to take all its share of the power as soon as it could be delivered.

With the two-stage development some of the power could be made available at an earlier date than if the single-stage scheme were carried out. The Premier of Ontario, in a published statement, expressed his pleasure at finding how much in accord were the two parties present at this conference, as it tended to international good feeling. It is only a short time since similar sentiments were expressed regarding the relations between Ontario and Quebec when agreement was reached as to the supply of electrical energy by the Gatineau Power Company to serve eastern Ontario. Thus do engineers work for the peace of the world.

Another matter recorded in the daily Press recently which to some extent concerns Canada, has been brought before the New York State Power Commission by some of the large power interests of the State.

It is proposed to develop 200,000 h.p. in the lower Niagara river; in order to do this two tunnels would be constructed, each 15,000 feet long and 35 feet in diameter. These tunnels would be about 250 feet below ground, a gross head of 90 feet and a net head of 81 feet being obtained, the difference would be due to friction losses in the tunnels. It is proposed to install six turbines of 35,000 h.p. each, and the total cost is estimated at about $30,000,000.

Such a scheme would accomplish for New York State what has already been done for Ontario by the Hydro Electric Power Commission, *i.e.*, utilise the head available between the foot of Niagara Falls and Lake Ontario.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Resistance Lamps.

In last week's issue you report a case at the Newcastle-under-Lyme Quarter Sessions where the defendant had connected a lamp to a power meter, and in which reference is made to the practice in Birmingham with regard to the use of lamps as resistances for the charging of accumulators.

In order that there may be no misapprehension I take this opportunity of stating that we do *not* allow lamps to be used for lighting purposes at power rates in cases where lamps are to serve as resistances. We allow lamps to be used as a resistance on a charging board only, and we should never allow, as was suggested in the case under review, a flex to be taken from the board to a lighting point for the purpose of illumination unless the consumer paid lighting rates for such supply. Our General Conditions of Supply make this quite clear, *viz.*, "If any lights are connected to a power circuit the whole of the current supplied to that circuit is charged at lighting rates."

R. A. Chattock,
City Electrical Engineer.

Birmingham, *July 20th*, 1926.

Overhead Line Construction.

In your article on minor aerial power lines in the current issue, the author refers to placing the earthed negative wire vertically below the live wire. As the practice which I adopt of placing the earthed wire on top offers better protection against lightning, it would be interesting to hear whether there are any objections to this course such as to cause the reverse method to be used in the case quoted.

C. H. Clarke.

London, *July 19th*, 1926.

This inquiry was submitted to Mr. R. Grierson, who replies as follows:—

"In the case discussed, it was considered desirable to place the live power line as far away from the telephone line as possible, and hence the writer's usual practice was reversed.

"In France, during the war, when one made one's own regulations, the neutral of a three-wire system was invariably run on the top of the pole and *earthed at each pole*. No trouble whatsoever was experienced with lightning on these systems, whereas in the case of a two-wire insulated system, without guard wire, a ridge pole of a hut was splintered, a concrete base to a 'Carron' stove split, a fuseboard blown off the wall, and a ¾-in. iron water pipe punctured at different times by lightning. The area, however, was subject to severe storms, and in one case the top line of a post and wire fence, only 3 feet above ground level, was spiralled as though it had been twisted in a torsion testing machine."

The Remuneration of Electrical Engineers.

We three electrical engineers, having read with interest, in the communal copy of the ELECTRICAL REVIEW, your correspondent's "Meditations on Remuneration," can confirm the accuracy of his remarks.

We find that three public school educations, three B.Sc. degrees, and five years' engineering experience apiece, provide us with an average remuneration of £200 a year.

As we have so far been unsuccessful in capturing the hearts of the three daughters of the local family grocer, we are fast coming to the inevitable conclusion that an engineer's reward is in the comforting thought that he is sent upon earth in order to provide deserving landladies with a comfortable income.

G. T. C., H. V. M., L. H.

July 24th, 1926.

Electrical Progress at Shanghai.

In your article on our annual report for 1925 in your issue of June 4th last, may I point out a small inaccuracy? In paragraph 2 you say "the plant capacity of the Riverside power station, including a 20,000-kW turbine then in course of erection, was at December 31st last 121,000 kW." In the last paragraph you mention that the 50,000-kW extension now in hand will consist of the 20,000-kW turbo-generator referred to. This is not so. The present capacity of the station is 121,000 kW, and the 20,000-kW set which was then being erected was to replace the Parsons machine which was destroyed in 1923. The 20,000-kW turbo-generator now being built is in addition, and will bring the plant capacity up to 141,000 kW. I might mention that the contract for this turbo-generator and condensing plant was placed with the Metropolitan-Vickers Company of Manchester.

T. H. U. Aldridge,
Engineer-in-Chief and Manager.

Shanghai Electricity Dept., *July 7th*, 1926.

Economy—Fuel and Otherwise.

Cannot something be done to reconcile the conflicting interests of the proposed Institution of Fuel Technology and the Institution of Fuel Economy Engineers? Here are proposals to set up Institutions dealing with practically one and the same object, *viz.*, the economical utilisation of fuel, and yet it does not seem to have appealed to the promoters that the economy stops short at fuel and that they are embarking on extravagance and waste by setting up at one and the same time rival Institutions on the matter.

Many of us are anxious to support a proposal of this character, but it is almost impossible to decide which of the two institutions will most effectively achieve the objects aimed at, and one feels reluctant to be mulcted in a double subscription when one should be sufficient for the purpose.

Surely something could be done at this early stage by the prominent men in the industry to secure an amalgamation of the conflicting ideals so as to obtain one institution, before the vested interests become too strong to bring about this desired end.

F. W. Purse,
Engineer and Manager.

West Ham Electricity Department,
July 24th, 1926.

[The formation of the Institution of Fuel Economy Engineers was announced in our issue of January 1st, 1926, p. 27; progress was recorded on February 26th, p. 342, its main objects being summed up as: To promote the science and practice of fuel economy engineering in all its branches, and to facilitate the interchange of ideas respecting improvements in the various branches of fuel technology.

On March 5th (ELEC. REV., March 12th, p. 414), a meeting was held at the Institution of Civil Engineers, at which it was resolved to form an Institution of Fuel Technology. The chairman, Sir Wm. Larke, referred to the existence of the Institution of Fuel Economy Engineers, which he understood was willing to co-operate so that there should be one national organisation; representatives of that body agreed, but urged that the existing Institution should be taken as a foundation on which to build the more comprehensive body. Eventually a committee was elected, and the chairman undertook that representatives of the Institution of Fuel Economy Engineers should be appointed on it. The view was put forward that the work in view could be done by a special group of the Society of Chemical Industry, but the consensus of opinion was in favour of a separate organisation. Progress was reported in our issue of April 9th, p. 588.

We commented on the subject on May 28th (p. 779), and referred to the intended collaboration between the two bodies. It appears, however, from a statement published in our issue of June 11th, p. 878, that the Council of the Institution of Fuel Economy Engineers is not satisfied with the proposed constitution of the Institution of Fuel Technology, holding that professional qualification for full membership is a vital factor, and the question of amalgamation is suspended pending agreement on this point. The Institution has been conducting an active campaign for new members during recent months, and is organising an autumn session.

The Society of Chemical Industry has constituted an official Fuel Section amongst its own members.

It will be seen that the present situation is confused and unsatisfactory. We heartily endorse Mr. Purse's appeal to the leaders of the engineering industries to do their utmost to avert the threatened calamity; it would be not merely unfortunate, but utterly fatuous to have two institutions in existence, covering the same ground, instead of one comprehensive and authoritative national institution.

Since writing the foregoing, we have received a communication from the Institution of Fuel Economy Engineers, which appears in our "Notes" pages.—EDS. ELEC. REV.]

Legal.

British Patents in the Irish Free State.

IN the Dublin Supreme Court on July 20th, Mr. Marnan appeared for the British Thomson-Houston Co., Ltd., and asked for a date to be fixed for the appeal of that company against the recent decision of Mr. Justice Meredith that its patents (and therefore all British patents granted before December, 1922) were invalid in the Irish Free State.

The CHIEF JUSTICE said that in view of the number of appeals that were pending it would be impossible to fix a day during the present sittings. He considered, however, that the rights of the parties concerned had not been determined by the refusal by Mr. Justice Meredith to grant an interlocutory injunction against Messrs. Litton & Co., Dublin, who were alleged to have infringed the plaintiff company's patents. People would therefore act at their own risk in the matter, if they acted at all.

Jubilee Electric Lighting Funds.

THE Isle of Man Chancery Court is being petitioned by the Attorney-General to decide what is to become of the money subscribed in the Queen Victoria Diamond Jubilee year to provide electric light for the village of Onchan. It was proposed as a memorial of the Jubilee that the village should be lit by electricity. The Manx Electric Tramway Co. was approached, and it agreed to put up the standards and light the village for ever, free of cost, if the village would raise £300, of which the company would subscribe £75. Subscriptions were collected amounting to £210 15s. 6d., and the tramway company erected the standards and lighted the village till 1900, when it went into liquidation. The liquidator of the company admitted a claim of £250 for breach of covenant, and the Onchan Commissioners applied that money in installing gas lamps.

West London and Provincial Electric Supply Co., Ltd.

MR. JUSTICE ROMER, in the Chancery Division on July 23rd, had before him a petition by the West London and Provincial Electric Supply Co., Ltd., to confirm an alteration in the company's objects, *viz.*, "to acquire and hold, dispose of, underwrite or guarantee the subscription of any stocks, shares, debentures, debenture stocks, obligations or securities issued or guaranteed by any company or other authority, and to carry on the general business of an investment trust company."

Mr. FARWELL, K.C. for the company, said there were no creditors and no debentures.

His LORDSHIP said the company had been a holding company for years, and now instead of holding shares in one company it wanted to hold shares in others. He sanctioned the alteration.

Walthamstow Council Summoned.

ON July 22nd, at the Stratford Police Court, the Walthamstow Urban District Council was summoned at the instance of five firms in its area of supply for cutting off electricity from their premises during the general strike.

Mr. W. B. FARADAY, for the complainants, said that under the Electric Lighting Act of 1909, the Council was bound to supply and maintain a supply to persons in its area under a penalty in default of 40s. per day. Counsel then referred to correspondence between the Council and one of the complainant firms, Messrs. D. Gilson & Co., screw manufacturers. In this the Council asserted that it was necessary to cease supplying electricity to the firm in order that essential services might be maintained. The manager of the firm stated that he refused admittance to two employés of the Council who were sent to cut off the supply, and they then withdrew power from an adjacent sub-station, bringing the firm's works to a stansdtill.

Mr. G. SPURR, the Council's electrical engineer, said that authority for the cutting-off of the supply was given by the Electricity Committee in the face of a threat that the whole of the power station men would be withdrawn unless only essential supplies were provided.

Mr. BLANCO WHITE, who appeared for the Council, said that that body only acted after very careful consideration of the position. It gave the order for the stoppage of "non-essential" supplies to prevent the town from being plunged into darkness. He asked the Bench to say that the Council's action was justified in the circumstances. Evidence was given in support of the Council's statements, but Mr. FARADAY said that the Council had neglected for eight days to apply to the Electricity Commissioners for assistance.

The magistrates held that the Council was liable to penalties and imposed a fine of 20s. for each day on which the default continued (from May 6th to 12th), together with costs amounting to 25 guineas. The other four summonses were dropped.

Fraud Charge Dismissed.

THE *Southend Standard* reports that at the London Sessions on July 21st, George J. Aston, dealer, and Thomas H. G. Steel, engineer, were found not guilty on charges of obtaining goods by false pretences and of conspiring to obtain credit by fraud. On behalf of the prosecution it was stated that Steel and Aston were associated with a man named Spurling in a concern known as the Thundersley and District Electricity Supply Co. Goods and machinery were ordered from various firms, including the Walsall Electric Co., Ltd., the Tungsram Electric Lamp Works and the Dominion Rubber Co., Ltd., for a power house at Bread and Cheese Hill, Thundersley. The goods were not paid for and the prosecution alleged that the power house did not exist. On behalf of Aston and Steel, it was stated that they were employed by Spurling as resident manager and chief electrical engineer respectively. Discussions took place with the local authorities regarding the lighting of the highways in the Thundersley district, and arrangements were made for the installation of electric plant at Bread and Cheese Hill. Spurling, it was stated, had disappeared when requests for payment for the goods were made. After evidence was given by a solicitor regarding the taking over of the premises at Thundersley by Spurling, and by a surveyor regarding the installation of the power house machinery, the jury stopped the case and acquitted prisoners, who were discharged.

Pneulec Machine Co., Ltd.

ON July 22nd this company presented a petition to the Staffordshire County Court, West Bromwich, to confirm the alteration of the company's objects in accordance with a special resolution passed at meetings of the shareholders. Power is to be taken, *inter alia*, to erect, construct, maintain, alter, repair, pull down or restore tramways, electric power stations and other works, as well as to carry on the business of teachers and instructors of foundry, metallurgical and engineering practice and to provide for the certification and registration of those who pass examinations which will be instituted by the company.

Embezzlement Charge.

CHARGED with having embezzled £6 13s. 5d., the money of Electrical Conduits, Ltd., Walsall, Albert N. Robson, traveller, was at Doncaster last week sent to prison for one month.

Mr. G. S. WARD said the defendant was appointed by the prosecutors as their agent and representative for the Doncaster district, in November last. Under his agreement it was stipulated that the money for goods sold for cash and any payments made to him on behalf of the company should be included in the agent's letter and report for the day. It was found that certain money received by the defendant had not been accounted for. Investigations were made and serious deficiencies were discovered. Defendant, said Mr. Ward, was only charged with one item paid by an electrical engineer. The latter's account was investigated, and it was found that between December of last year and June of this year there were 19 items amounting to £90 11s., which the defendant had not accounted for. There were other cases, and the total amount involved, so far as could be ascertained, was £172 17s. 3d. There was a question of certain commissions due to defendant, and it was agreed, out of this amount, that he was probably entitled to £62.

For the defendant, Mr. W. G. C. MAW said that Robson had a wage of £1 a week and commission. As a commercial traveller he had to keep up appearances. Since November he had had a turnover of £2,500. His commission was 5 per cent.

Electrolux, Ltd., v. Heron.

IN the Cork District Court, before District Justice D. B. Sullivan, B.L., last week, Electrolux, Ltd., sued Emily Heron, of Cork, for £15 17s. 6d., being the amount due for goods sold and delivered.

Mr. LEO MCGRADY said that in July, 1925, a vacuum cleaner was sold to the defendant for £15 17s. 6d. The amount was never paid, and the machine was returned to the plaintiff firm in January, 1926. It then had the appearance of having been considerably used, and the depreciation was estimated at £7 10s.

The defence was that a salesman of the London firm had agreed with the defendant that the delivery of the machine to her at Cork was not to be a sale, but a demonstration. Defendant had no intention of purchasing the machine.

A letter from the agent was read, in which the defendant was told to keep the machine until he came to Cork again. Since then the agent had left the firm's employment. The defendant had used the machine only a few times.

Justice Sullivan dismissed the case.

Tramway Manager's Libel Actions.

AT the West Riding Assizes, Leeds, on July 22nd, Mr. A. R. Fearnley, general manager of the Sheffield Corporation tramways, brought an action for libel against the officials of the Sheffield Federated Trades and Labour Council and the editor and printer of the *Sheffield Forward*, the Council's official organ. The action arose out of a ballot taken by the Sheffield Tramways Committee to ascertain if the employés of the department were willing to return to work under their agreement which they were stated to have broken by ceasing work during the general strike. The defendants alleged that this ballot was not conducted in a proper manner and that the plaintiff and the chairman of the Committee were guilty of improper practice in this connection.

The jury found for plaintiff against all the defendants, who pleaded fair comment on a matter of public interest, and as to four of them non-responsibility, and awarded him one farthing damages. The JUDGE (Mr. Justice Finlay) held that this was not merely a contemptuous award, but signified that the plaintiff's honour could not be touched by such allegations as had been made. He therefore awarded the plaintiff his costs, but granted a stay of judgment of 14 days upon the application of Sir Henry Slesser for the defendants.

A second case of a similar nature was brought by Mr. Fearnley against Mr. C. J. Mitchell, a schoolmaster; in this instance slander was also alleged. The slander was uttered at a public meeting, when the defendant attacked Mr. Fearnley's integrity with regard to the ballot mentioned in the first case. The libel took the form of a communication to the Lord Mayor and Town Clerk of Sheffield. The defendant pleaded fair comment.

The JUDGE said that although the ballot was not absolutely secret in one sense, which was perhaps unfortunate, it was not the intention of the plaintiff or the chairman of the Tramways Committee to discover how any man had voted. He awarded plaintiff £25 in respect of the slander and £50 in respect of the libel, together £75, and costs.

Electrical Refrigerator Sales.

FROM announcements and comments appearing in the *Electrical World* (July 10th), it appears that the Delco Light Company is embarking on a twenty-million-dollar building programme to expand its facilities for manufacturing electrical refrigerators. At the same time it is announced that one hundred million dollars has been pledged by the directors of the General Motors Company, the parent organisation, to support the development of the refrigeration market. "Most electrical appliance manufacturers in the past have been content with a policy of small production and high prices. But that is not the viewpoint of men schooled in the automobile industry. . . . There are many interesting lessons to the electrical industry in the record of the automobile, and it is fortunate that two of the largest manufacturers of electric refrigerators are offshoots of the motor-car industry. They come into the electrical appliance field with the automobile man's naturally large ideas of the possibilities of mass production and highly organised selling. Their leadership should be watched and welcomed. For new blood brings vigour always, and the growth of the refrigeration industry is already making history in the electrical world." Our contemporary, in discussing the scope for electrical refrigerator sales, states that when the "great American public" wants anything, if it has made up its mind it has got to have it, the cost of an article does not make a great deal of difference. It is remarked that one company, in addition to the training of personnel for the selling and "servicing" of electrical refrigerators defined a policy calculated to meet the financial position of the prospective customer, as it was felt that households whose income fell below a specified figure would not be interested in electrical refrigeration—in fact, could not afford it. As the sales campaign got under way and orders came in, it became very apparent that the cost of the machine in dollars and cents was not the most important item in consideration.

While we have to remember that America is nowadays a land of wealth with a prodigal spending spirit, we may also remember that there are some hundred thousands of the public in the United Kingdom whose circumstances should enable them to adopt electrical refrigeration during the next few years.

Longitude Determination by Wireless.—The United States Naval Observatory announces that there will be a world longitude determination by radio signals, beginning on October 1st and ending on December 1st, 1926, for the purpose of determining the differences in longitude with great accuracy, and to re-determine at intervals sufficiently separated in time the permanency of their relative positions, and certain possibilities as to movement of the earth's crust. The project has the approval of the International Astronomical Union and of the International Geodetic and Geophysical Union. The principal stations of the "fundamental polygon" will be the United States Naval Operating Base, San Diego, California; Algiers Observatory, in Africa; and the Shanghai Observatory, in China, at nearly the same latitude and approximately eight hours apart in longitude. Many other observatories are expected to join in this operation, including Washington, Greenwich, Paris, and Australasian observatories; the United States Coast and Geodetic Survey will occupy stations at Honolulu and Manila. The radio signals will be of the rhythmic type, so spaced that there will be 61 signals per minute for 5 minutes, or 306 in all at each sending period. They will be sent three times daily for 5-minute periods and short-waves are to be used as well as long-wave signals, as some observers report better reception of short waves, especially at very distant stations, when there is not much daylight between the stations.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Radio Station in Tanganyika.—On July 19th, Mr. ORMSBY-GORE informed Brig.-Gen. Warner that the Government of Tanganyika territory intended to erect a radio station at Dares-Salaam during the current financial year.

A Bedfordshire Scheme.—On July 20th, in reply to Mr. Wells, Colonel ASHLEY said he had consented to the erection of overhead lines through the main street of Sharnbrook (Beds.) by the Rushden and District Electric Supply Co., subject to the undertakers complying with the overhead line regulations prescribed by the Electricity Commissioners for the public safety. Before doing so, he was satisfied that the Bedford Rural District Council, the local authority for the purposes of the Electricity (Supply) Acts, 1882-1922, in respect of the parish of Sharnbrook, had no objection to the erection of the lines.

Swindon Corporation Bill.—On July 21st, on the second reading of this Bill in the House of Lords, Lord BANBURY gave notice that on the third reading he would move a new clause providing that a corporation supplying electricity should be liable for all damage or loss that might be sustained by the consumer with whom an agreement to supply energy was in force, if the corporation had failed or neglected without reasonable excuse or unlawfully refused to supply. The corporation should be liable to a penalty not exceeding £50 a day for each day during which default continued, and the penalty would be a surcharge on the members of the corporation, jointly and severally. This clause, he said, had been rendered necessary by the action of the Swindon Corporation during the general strike.

Trade-Mark Applications.

THE following are among the recent aplications for British trade marks. Objections against either of the marks may be lodged within one month from July 21st :—

Ethovernier. No. 470,607. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Burndept Wireless, Ltd.

Stop (lettering and design). No. 470,245. Class 50. Wall plugs or sockets.—The Rawlplug Co., Ltd.

Published Specifications.

Compiled expressly for this journal by Patent Agents
The name of the applicant's patent agent, if any, will be found on the printed specification.
The number in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1924.

31,249. "Overload cut-outs. E. C. R. Marks (Voigt & Haeffner Akt.-Ges.). December 30th, 1924. (254,348.)

31,266. "Electrical impulse generator." P. Kapitza and M. Kostenko. December 30th, 1924. (254,349.)

1925.

2,922. "Selective devices for radio-telegraphic reception and like purposes." R. A. W. Watt, E. V. Appleton, and J. F. Herd. February 2nd, 1925. (254,353.)

5,951. "Electromagnetic, acoustic, or like means for indicating navigable channels for ships." Soc. Industrielle des Procédés W. A. Loth. March 7th, 1924. (230,462.)

8,246. "Electromagnetic apparatus." Siemens Bros. & Co., Ltd., and W. H. Grinsted. March 27th, 1925. (Cognate application 2,262/26.) (254,364.)

8,442. "Automatic reversing-switch or pole-changing mechanism for dynamo electric machines." J. Stone & Co., Ltd., and A. E. Kennard. March 30th, 1925. (254,370.)

8,443. "Electrical condensers." A. E. Watkins. March 30th, 1925. (254,371.)

8,454. "Electromechanically-controlled systems and switching apparatus therefor." F. Aldendorff. March 30th, 1925. (254,373.)

8,956. "Electric coil-holcers, variable inductances, variable condensers, and the like." G. Kent, Ltd., H. T. Honnor, and D. R. A. Pistor. March 30th, 1925. (Cognate application 15,602/25. (254,376.)

8,794. "Former for electric inductance coils." A. J. Clitheroe. April 2nd, 1925. (254,380.)

8,801. "Metal-clad electric switchgear of the draw-out type." A. Reyrolle and Co., Ltd., W. Anderson, and H. W. Clothier. April 2nd, 1925. (254,391.)

8,837. "Means for preventing the overcharging of accumulator batteries." Vickers, Ltd., and J. Etchells. April 2nd, 1925. (254,393.)

8,984. "Wireless lead-in and lightning conductor." J. A. Dixon. April 4th, 1925. (254,399.)

9,037. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. April 4th, 1925. (254,401.)

9,047. "Electromagnetic microphones or the like, adapted to be actuated by a gramophone or like record." H. J. Round. April 4th, 1925. (254,403.)

9,053. "Loud-speaking telephonic receivers." E. A. Graham. April 4th, 1925. (254,404.)

9,122. "Electric fires." H. H. Berry and J. W. Reid. April 6th, 1925. (254,406.)

9,156. "Alternating-curre.it relay." W. K. Howe. April 6th, 1925. (254,409.)

9,282. "Intermitte.it inductive train-control system." W. K. Howe. April 7th, 1925. (254,412.)

9,317. "Boxes, cabinets, and the like, for wireless signalling apparatus." E. Gunn. April 8th, 1925. (254,413.)

9,498. "Relays." Igranic Electric Co., Ltd., and J. H. Abbink-Spaink. April 9th, 1925. (Cognate application 19,048/25.) (254,418.)

9,762. "Automatic electric switches." Akt.-Ges. Brown, Boveri et Cie. April 28th, 1924. (232,948.)

10,097. "Supply of current to thermionic valves." M. Nicaise. April 17th, 1925. (254,422.)

10,149. "Alternating-current generators employing thermionic valves." C. R. Burch, N. R. Davis, and Metropolita.-Vickers Electrical Co., Ltd. April 18th, 1925. (254,424.)

10,284. "Coarse and fine adjustment devices for radio receivers." A. C. Hayden. April 20th, 1925. (254,427.)

10,459. "Elevator systems and apparatus in connection therewith." F. Lane and W. A. Machine. April 22nd, 1925. (254,429.)

10,501. "Telephone plug and cord connectors." Sterling Telephone and Electric Co., Ltd., and N. Blades. April 22nd, 1925. (254,431.)

10,570. "Alternating-current dynamo-electric machines." British Thomson-Houston Co., Ltd. April 23rd, 1924. (232,968.)

10,729. "Submarine sound reception." Submarine Signal Corporation. April 2nd, 1925. (250,160.)

10,776. "Electric load regulator." G. Wilkinson. April 25th, 1925. (254,439.)

11,396. Dynamo-electric machinery." K. Nobuhara. May 1st, 1925. (Patent of addition not granted.) (254,446.)

11,472. "Advertising and like signs." A. H. Brackensey and Franco-British Electrical Co., Ltd. May 2nd, 1925. (254,450.)

11,631. "Automatic or semi-automatic telephone systems." Coventry Automatic Telephones, Ltd., and E. P. Fairbairn. May 5th, 1925. (254,453.)

11,894. "Electromagnetic switches." A. H. Railing and A. E. Angold. May 7th, 1925. (254,455.)

12,216. "Automatic control of groups of dynamo electric machines." English Electric Co., Ltd., and R. A. R. Bolton. May 11th, 1925. (Addition to 235,701.) (254,460.)

12,969. "Electric water-heaters." O. Gractzer. May 18th, 1925. (Convention date not granted.) (235,170.)

14,002. "Space discharge tube systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). May 28th, 1925. (254,472.)

14,191. "Process for drying the insulation of electric cables." S. Bragin. May 29th, 1925. (254,474.)

14,211. "Power line carrier-wave signalling system." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). January 31st, 1925. (246,785.)

14,355. "Electric telephone receivers." S. Hirosawa. June 3rd, 1924. (235,189.)

14,675. "Ignition plugs for internal-combustion engines." B. Hopps and A. M. Lodge. June 5th, 1925. (254,482.)

14,695. "Transmission of complex frequency currents over telephone and like lines." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). June 26th, 1924. (236,189.)

15,024. "Process for indicating switching-out processes in single or polyphase alternating current circuits." Siemens-Schuckertwerke Ges. June 27th, 1924. (236,196.)

15,445. "Electric lighting systems for motor vehicles." E. T. Middlemiss and G. A. Edwards. August 13th, 1925. (254,489.)

15,828. "Generators of electric oscillations." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). June 18th, 1925. (254,496.)

15,993 "House service fuse-boxes." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. June 20th, 1925. (254,498.)

16,102. "Process of manufacturing electric insulators." Deutsche Isolatoren-Und Apparate-Ges. December 30th, 1924. (245,411.)

16,126. "Variable condensers and like instruments having relatively rotatable members." British Thomson-Houston Co., Ltd., and S. C. Bateman. June 22nd, 1925. (254,502.)

16,343. "Thermionic apparatus." F. Holweck. June 26th, 1924. (Addition to 206,155.) (236,220.)

16,902. "Telephone communicating and alarm systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). July 2nd, 1925. (254,511.)

17,032. "Electromagnetic talking-machines." Vox Maschinen Akt.-Ges. July 3rd, 1924. (Addition to 236,237.) (236,574.)

17,225. "Amplifying horns." Gramophone Co., Ltd., and H. L. T. Buckle. July 4th, 1925. (254,513.)

17,654. "Electric lampholders." W. V. Butterfield and Mycromet Manufacturing Co. July 9th, 1925. (254,519.)

18,588. "Electric lanterns." S. D. White and E. H. Penwarden. July 21st, 1925. (254,528.)

18,990. "Illuminating devices for simulating daylight." A. R. St. Clair. July 25th, 1925. (254,530.)

20,644. "Carrier-current broadcasting system." Wired Radio Inc. January 9th, 1925. (245,725.)

21,501. "Electrodynamic loud-speakers." O. Bothe. December 4th, 1924. (244,051.)

22,204. "Locking-means for controlling the circuit of an electrically actuated device or devices or apparatus." E. Potter (Electric Combination Lock Co., Ltd.) September 5th, 1925. (254,554.)

22,222. "Process for making electron-emitting electrodes." Dubilier Condenser Co. (1925), Ltd. September 5th, 1924. (239,539.)

22,245. "Construction of dynamo-electric machines." English Electric Co., Ltd., and E. H. H. Hassler. September 5th, 1925. (254,555.)

24,414. "Electric cables, and the process for making same." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.), (Bell Telephone Laboratories, Inc.). September 30th, 1925. (254,566.)

24,799. "Arrangement for the adjustable magnetic short-circuiting of self-induction elements and transformers in wireless receiving stations." L. Bonnet. October 5th, 1925. (254,568.)

25,437. "Electric water-heaters." M. S. Gazelle. October 12th, 1925. (254,572.)

26,509. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. October 23rd, 1924. (241,932.)

27,462. "Telephone receivers." H. R. Richardson and R. W. Whitley. November 2nd, 1925. (254,582.)

28,789. "Electric variable condensers." P. C. Rushen (Patent Electric Co., Inc.). November 14th, 1925. (254,591.)

28,848. "Electrical plug-switches." F. W. Row. November 16th, 1925. (254,592.)

29,084. "Automatic electric switches." British Thomson-Houston Co., Ltd. November 28th, 1924. (243,712.)

30,114. "Variable square law electric condensers." A. Cianchi. November 13th, 1925. (254,596.)

31,272. "Cooling radiators for electric transformer tanks and like uses." St. George's Engineers, Ltd., H. Purslow, and J. Anderson. December 11th, 1925. (254,600.)

31,343. "Mercury arc rectifiers." British Thomson-Houston Co., Ltd. December 31st, 1924. (245,432.)

31,362. "Means for preventing release of the main automatic switches of sound units of electrica. installations in the event of short circuit in one unit." Akt.-Ges. Brown, Boveri et Cie. February 16th, 1925. (247,522.)

31,905. "Automatic reclosing circuit-breaker systems." British Thomson-Houston Co., Ltd. December 17th, 1924. (244,793.)

32,458. "Oxide cathodes for discharge tubes and processes for manufacturing same." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 24th, 1924. (245,145.)

32,459. "Manufacture of oxide for discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 24th, 1924. (245,146.)

32,784. "Leading-in means, particularly for high-tension currents." Lodge-Cottrell, Ltd. (Metallbank und Metallurgische Ges. Akt.-Ges.). December 29th, 1925. (254,605.)

1926.

437. "Welding or cutting by electric arc." Soc. Alsacienne de Constructions Mécaniques. January 8th, 1925. (245,776.)

762. "Electrically-driven rotary pumps." O. Simmen. April 6th, 1925. (250,177.)

2,646. "Electric ovens." R. Male. March 30th, 1925. (249,830.)

4,288. "Cable structure." Standard Underground Cable Co. March 19th, 1925. (249,488.)

6,026. "Tubular electric incandescent lamps." General Electric Co., Ltd. October 8th, 1925. (254,639.)

6,906. "Telephone systems." Automatic Telephone Manufacturing Co. Ltd. August 22nd, 1924. (Divided application on 238,851.) (249,154.)

8,467. "Electric soldering machines." British Thomson-Houston Co., Ltd. March 28th, 1925. (249,887.)